

EXPENDITURE CONTROL MEASURES IN DRG-BASED HOSPITAL PAYMENT SYSTEMS



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All experts and stakeholders consulted within this report were selected because of their involvement in the topic of this report. Therefore, by definition, each of them might have a certain degree of conflict of interest to the main topic of this report.

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LIST OF ABBREVIATIONS

ABBREVIATION	DEFINITION
ABF	Activity-based funding
ACE	Acute Care Episode
AMI	acute myocardial infarction
APR-DRG	All Patient Refined-Diagnosis Related Group
ARS	Agence Régionale de Santé / Regional Health Agency (France)
ASST	Azienda Socio Sanitaria Territoriale / Health Territorial Authority (Italy)
ATS	Agenzia di Tutela della Salute / Health Protection Agency (Italy)
BFM	Budget of Financial Means
CBA	Controlled before-after study
CC	complication and comorbidity
CCU	coronary care unit
CEO	Chief Executive Officer
CFO	Chief Financial Officer
CI	Confidence Interval
CMO	Chief Medical Officer
COPD	Chronic obstructive pulmonary disease
COVID	Coronavirus disease
CT	Computed tomography
DBC	Diagnose Behandelcombinatie
DID	Difference in differences
DRG	Diagnosis Related Group
EBP	Episode-based payment
ECMO	Extracorporeal membrane oxygenation
ED	Emergency department
EDS	Episode de soins / Episode-based funding (France)



EHIF	Estonian Health Insurance Fund
ENC	Etude Nationale de Coûts / National Cost Study (France)
FDA	Fixkostendegressionsabschlag / Fixed-cost depression deduction (Germany)
FFS	Fee-for-service
GHM	Groupes Homogènes de Malades / Homogeneous patient groups (France)
GHS	Groupes Homogènes de Séjours / Homogeneous groups of stays (France)
GHT	Groupement hospitalier de territoire / Local hospital group (France)
HBC	Homogén Betegségcsoporthok / Homogeneous Disease Group (Hungary)
HIF	Health Insurance Fund (Hungary)
HIV	Human Immunodeficiency Virus
HNDP	Hospital network development plan (Estonia)
HRG	Hospital Resource Groups
ICU	Intensive Care Unit
InEK	Institut für das Entgeltsystem im Krankenhaus / National Institute for the Reimbursement of Hospitals (Germany)
IT	Information Technology
ITS	Interrupted time series
KHVVG	Krankenhausversorgungsverbesserungsgesetz / Hospital Care Improvement Act (Germany)
LG	Leistungsgruppen / Care delivery groups (Germany)
LOS	Length of Stay
MA	Meta-analysis
MLA	Mehrleistungsabschlag / Additional-volume-deduction (Germany)
MRI	Magnetic Resonance Imaging
NA	Not applicable
NEAK	Nemzeti Egészségbiztosítási Alapkezelő / National Health Insurance Fund Administration (Hungary)



NGT	Nominal group technique
NHIFA	National Health Insurance Fund Administration (Hungary)
NHS	National Health Service
NS	Non-significant
OECD	Organisation for Economic Co-operation and Development
ONDAM	Objectif national de dépenses d'assurance maladie / National Expenditure Targets (France)
OR	Odds ratio
P4P	Pay for Performance
P4Q	Pay for Quality
PICO	Patient, Intervention, Comparison, Outcome
PPS	Prospective Payment System
PVL	Performance Volume Limit (Hungary)
RCT	Randomised Controlled Trial
RDC	Relative Difference Change
RIZIV – INAMI	Rijksinstituut voor Ziekte- en Invaliditeitsverzekering – Institut National d'Assurance Maladie-Invalidité / National Institute for Health and Disability Insurance
ROM	Risk of Mortality
RR	Relative Risk
SHI	Social Health Insurance
SMART	Specific, Measurable, Achievable, Relevant, Time-bound
SMD	Standard Mean Difference
SOI	Severity of Illness
SR	Systematic Review
SSN	Servizio Sanitario Nazionale / National Health System (Italy)
SSR	Servizio Sanitario Regionale / Regional Health System (Italy)
SSR	Soins de suite et de readaptation / Post-acute and rehabilitation service (France)



STEMI	ST-elevation myocardial infarction
TB	Tuberculosis
TIA	Transient ischaemic attack
US	United States

■ SCIENTIFIC REPORT

1 INTRODUCTION

1.1 Background

Intended and unintended consequences of DRG-based payments per case

The last significant reform of the hospital payment system in Belgium took place in July 2002. This reform replaced the per diem rate by the national average length of stay per pathology group (All Patient Refined-Diagnosis Related Groups or APR-DRGs) as a basis for distributing the largest part of the closed-end national budget to individual hospitals. A reform of the system that was introduced in 2002 has been on the (political) agenda for many years in Belgium. A consistent theme in the reform plans and implementations over the past decade has been the shift from a hospital budget allocation based on DRGs to a DRG-based payment per case.

Since the 1990s, a large number of countries have introduced activity-based funding based on DRGs or a comparable classification system.¹ Broadly speaking, three interrelated concepts need to be defined for DRG-based payments per case: the catalogue (the classification system or grouper), the product and the price or tariff.

- Catalogue – In order to use a common vocabulary, many countries use a classification system that originates from the US DRG system; others developed their own classification, such as for example France. In principle, DRGs group hospital cases based on their diagnoses, procedures and other variables into economically, statistically and clinically homogeneous groups. The current system used in Belgium are APR-DRGs, which comprehends four levels for severity of illness (SOI) and four levels for risk of mortality (ROM).
- Product – However, no single case-mix system is able to level out variations caused by outliers. Therefore, separate payments for outliers are needed. Moreover, DRG-type payments are never all-inclusive, but rather combined with other types of payments (global budgets, fee-for-service (FFS), bundled payments, pay-for-quality, etc.) for



excluded patient groups, services and products, and hospitals or hospital departments.²

- Price/tariff – Payments per case are based on the average costs per case, ideally reflecting evidence-based practice. A DRG-based payment per case breaks the link between the amount of services that are provided per case by an individual hospital and payment.

A DRG-based payment per case is, however, not without its challenges and limitations, just like any other payment system. In theory, payments per case incentivise hospitals to reduce the cost per treated patient, to increase revenues per patient and to increase the number of cases.^{3, 4} More specifically, potential unintended behaviour includes premature hospital discharges, unplanned readmissions, increased volume for unnecessary care, patient selection and upcoding.

Policy measures to mitigate the financial risk for payers

Countries introduced DRG-based payment systems with varying objectives, influenced by their previous payment models.^{1, 4} For countries that shifted from a FFS system to DRGs, the main objective was to reduce lengths of stay and control overall costs without sacrificing quality. Countries that previously used global budgets sought to boost hospital activity, enhance efficiency, and improve transparency within their healthcare systems. A switch from a retrospective (FFS) to a prospective hospital payment scheme shifts the financial risk for the costs per case from the payer to the provider. Costs that exceed the DRG tariff are borne by the provider. However, because hospitals have an incentive to increase the number of cases, the financial risk for the macro-level budget is mainly for the payer.

Alongside the introduction of DRGs, additional policy measures were implemented to mitigate undesirable incentives arising from assigning hospitals an average price for a specific product. Some countries introduced volume or price control mechanisms (with hard or soft budget caps) to ensure that the macro-level budget is not exceeded.

Reforms and a recent move away from DRG-based payments per case

Although DRG-based payments were innovative in the 1990s and the early 2000s, they are now regarded as a traditional payment method just like global budgets or FFS payments. These traditional payments methods are still the dominant payment method but innovations in the payment mechanisms in order to deliver better value to patients are becoming widespread. In some cases, countries started to move away from DRG payments or to reform the pathology-based payment systems. After all, previous attempts to address the limitations of DRG-based payments per case, such as implementing volume or price control measures, have not always met their intended goals and have also introduced unintended negative side effects.¹ Therefore, countries all over the world are exploring more comprehensive strategies and innovative ways of paying health providers to counterbalance the shortcomings of traditional payment methods or to address new health policy objectives such as co-ordination and quality.⁵ These payment innovations can be classified into add-on payments which come on top of more traditional payment methods, and bundled (expanding the definition of a 'case' to include providers beyond hospitals) and population-based payments.

From a DRG-based budget allocation to a case-based payment for Belgian hospitals

In the reform plans for the hospital sector of the minister of Public Health it is stipulated that the current payment system will be replaced by a case-based payment, based on costs.⁶ This tariff per APR-DRG/SOI will include care-related components currently financed by the hospital budget (called the Budget of Financial Means (BFM)), pharmaceuticals, medical devices and part of physician fees covering practice costs.

The following preconditions were defined in the reform plans of the minister:

- A fixed amount per case is less appropriate for high-risk patients or patients with a highly complex disease. The cost per case is difficult to predict on the basis of diagnosis and procedures because costs are highly variable. Therefore, all countries with a DRG-based payment system introduced other payment methods in addition to DRG-based



payments for these cases.² The exclusion elements as well as their funding (e.g. a flat rate per day instead of per admission or based on real costs) still have to be defined.

- Control measures are needed to avoid unnecessary hospital admissions and a budget overrun.

1.2 Objective, research questions, scope and methods

The objective of this report, which was requested by the current (2024) minister of Public Health, is to issue recommendations regarding **control mechanisms to avoid unnecessary hospital admissions and a budget overrun** with a case-based payment system based on DRGs.

The general aim of the report can be detailed into the following **research questions**:

- Which policy measures were taken in other countries that introduced a DRG-based hospital payment system to secure budgetary control? What lessons can be learned from this international experience?
- How do Belgian experts perceive the feasibility and desirability of implementing mechanisms to secure budgetary control as applied in selected countries? Which preconditions have to be fulfilled?

Scope of the study

In order to fully understand the scope and role of the control mechanisms that were introduced in the selected countries, background information on the DRG-based payment system was also gathered: What is the share of DRG-based payments in total hospital payments in selected countries? For which patient groups, hospital stays or services/products do hospitals receive other (additional) payments besides DRG-based payments? How

are hospitals reimbursed for these patient groups, hospital stays or services/products?

To learn from experience with a DRG-based payment system in other countries, we also elaborate on

- the impact of DRG-based payments per case on quality, efficiency and costs;
- payment reforms with an impact on the role of DRG-based payments that have been introduced.

In addition to the reform plans for the hospital budget in Belgium, a reform of the nomenclature of physician fees was launched in September 2019. Most physicians in Belgium are self-employed and are (mainly) paid on a FFS basis. The actual tariff per service is described in a very detailed fee schedule (nomenclature). The fees are supposed to cover the cognitive and physical labour of the physician (the professional fee), but in most cases also part of the costs directly or indirectly linked to the provision of medical activities. Physicians working in a hospital cede part of their fee to the hospital, to help finance these practice costs. The reform plans include the development of a new catalogue and the distinction between a professional fee and practice costs. At this time, however, no final decision has been made on how these practice costs will be funded. One possibility is that they will be covered by the DRG tariff (see KCE report 380).⁷ Examining the advantages and disadvantages of different options is beyond the scope of this report.

Methods

The study follows a **mixed-methods approach**. The main steps are summarised in Table 1. The methods are also outlined at the beginning of the respective chapters (where relevant).

**Table 1 – Mixed-methods approach**

What?	How?
Description of the current Belgian payment system and reforms/reform plans	Review of grey literature, policy papers and previous KCE reports
Horizon scanning exercise	Review of the literature Step 1: identification of countries with a DRG-based hospital payment system per case (long list) Step 2: identification of countries with control mechanisms (short list)
International comparison of DRG-based payments per case, control mechanisms and payment reforms in five countries (Estonia, France, Germany, Hungary and Italy/Lombardy)	Development of a template (with elaborate table of contents + short description) for the country reports Review of peer-reviewed and grey literature + consultation of experts in the respective countries for the country reports Review by the authors of the country reports of the transversal analysis
Umbrella review	Systematic search of systematic reviews on the impact of DRG-based payments per case on efficiency, quality of care and costs
Expert panels	Consultation of Belgian experts via nominal group technique
Scientific validation	Review of the scientific report and Supplement by three independent, international scientific experts

The report is structured as follows. Chapter 2 covers the current Belgian hospital payment system, reforms plans, implementations, and the results of relevant KCE reports. Chapter 3 provides a transversal analysis of the case-based payment systems, control mechanisms and payment reforms in selected countries. The detailed country reports are included in a [Supplement](#) to this report. In Chapter 4, an umbrella review of the literature was conducted to assess the impact of DRG-based payment systems. Chapter 5 describes the results of the expert panels, in which the point of view of Belgian experts and stakeholders on DRG-based payments per case and control mechanisms was explored. Chapter 6 concludes with a discussion and an overview of limitations of this study.

Chapter 3 was reviewed by a Belgian content expert and by the authors of the country reports.



2 HOSPITAL PAYMENTS IN BELGIUM: CURRENT SYSTEM, REFORM PLANS AND IMPLEMENTATION

In this chapter, we briefly describe the current hospital payment system, reform plans and implementation in the last decade, as well as the main results and/or recommendations of previous KCE reports on this topic.

2.1 Current hospital funding in Belgium

A DRG-based hospital budget allocation

Hospitals receive their revenue from different sources, of which the BFM and deductions on physician fees are the two largest sources^a. In 2023, the BFM made up 37% of total hospital revenue while 38% was from fees.⁸ Belgian hospitals are either public or not-for-profit, as for-profit hospitals are not permitted. The rules for allocating the BFM to individual hospitals are identical regardless of ownership type.

The BFM is a closed-end budget divided into various parts and subparts, with subpart B2 being the largest, accounting for 36.3% of the BFM in 2023 for general hospitals.⁹ Subpart B2 includes costs for clinical services provided by nursing and other staff (excluding medical staff) and medical products. The budget for subpart B2 is set at the national level and is allocated to individual hospitals based on a point system: the national budget is divided by the total number of B2 points 'earned' by all hospitals, determining the monetary value of one B2 point. Points are earned according to the activities delivered. A key concept is 'justified activities', which are determined by the number and type of admissions during reference years. A national average length of stay is calculated for each

APR-DRG/SOI (All Patient Refined-Diagnosis Related Group/Severity of Illness), and this average is applied to each hospital's case mix.¹⁰ Multiplying this national average length of stay by a hospital's case mix yields the number of justified patient days for that hospital. Unlike many other countries, Belgium does not use a DRG-based payment per case but rather allocates the budget based on APR-DRG/SOI, using weights based on average length of stay instead of cost weights.

Other selected subparts are:

- B1: covers practice costs ('hotel costs' of the patient). The closed-end B1-budget is allocated to individual hospitals mainly on the basis of the number of licensed beds and the share in total hotel costs (administration, heating, maintenance, etc.);
- B6 and B9: cover labour costs that were negotiated in social agreements;
- B8: with this closed-end budget hospitals receive extra payments for vulnerable patients to compensate for the extra costs they generate.

A complex and untransparent calculation of the individual hospital budget

The distribution of the national hospital budget to individual hospitals is determined by a complex and opaque calculation method, with distinct rules and parameters for each subpart. Although the rules and exceptions on each rule have on itself a rationale, over time, the entire system has become very complex and lacks transparency. Additionally, corrections are sometimes delayed by many years, complicating hospitals' ability to monitor their financial results.

^a Since the 6th State reform in 2014, the federated entities have full responsibility for funding investment costs, while the federal level remains responsible for funding operating costs. The description of hospital funding in Belgium in section 2.1 only includes funding of operating costs.



A drive for production

With a national closed-end hospital budget, overall expenses can be controlled at a macro level. The method of allocating the national budget to individual hospitals ensures that expenses remain within the predefined budget. However, an increase in hospital activity (and thus the number of points) reduces the monetary value of each B2 point. Because the medical-technical capabilities often exceed the available budget, competition among healthcare providers is inevitable. The current allocation rules encourage hospitals to increase activity, potentially leading to inappropriate admissions and premature discharges. Examples of overservicing that are well-documented are laboratory tests, medical imaging (such as CT imaging)¹¹, placing knee or hip replacements too quickly¹², or duplicate investigations due to lack of coordination. As a result of the closed-end budget, each hospital's share depends not only on its own activity but also on the activity level of all other hospitals, creating financial uncertainty due to post-factum adjustments of each hospital's budget share.

A fragmented case-mix system

During the last decades, lump-sum payments, partly based on APR-DRGs, have been introduced in the Belgian hospital payment system, e.g. the lump sums for laboratory testing and medical imaging and a (separate) case-based system for a subset of inpatient pharmaceutical specialties. However, in comparison to other countries, the implementation of case-mix hospital payments in Belgium is very fragmented and partial.¹³

Towards a DRG-based tariff per case

The current system relies on justified beds, which are calculated based on the national average length of stay for each pathology group (APR-DRG/SOI) applied to a hospital's case mix. However, a pathology-weighted length of stay is merely a proxy for resource use or cost. One lesson from international experience is the importance of having high-quality, up-to-date cost data, which Belgium currently lacks due to the absence of a mandatory patient-level cost data collection. Under the reform plans of Minister Vandenbroucke, the existing payment system will be

replaced by a case-based payment structure based on costs. This new tariff per APR-DRG/SOI will, according to these plans, include care-related components currently financed by the BFM, as well as pharmaceuticals, medical devices, and part of physician fees (practice costs). In other countries, DRG-type payments are typically not all-inclusive but are combined with other forms of payments.

We refer the interested reader to KCE reports 207⁴, 229¹⁴, 302² and 380⁷ for a more elaborate description of the hospital payment system.

2.2 Brief history of reform plans and implementations

In Belgium, policymakers want to transition to a DRG-based payment system per case to address issues like the lack of incentives for efficiency under the current closed national budget and the mismatch between hospital activities and their financing. The goal is to better reflect the complexity and volume of care provided, reduce cross-subsidisation between services, and ensure a more equitable and transparent distribution of resources.

Under DRG-based payments per case, hospitals are reimbursed according to the volume and complexity of cases they handle. As a result, treating more patients generates higher revenue, which may incentivise hospitals to increase patient throughput. Several countries have implemented DRG payments to help reduce waiting lists. In Belgium, however, waiting times are not systematically measured, as official statistics on this issue are lacking. Some fragmented and one-off studies suggest that waiting times can vary significantly depending on the region, hospital, or type of care.¹⁵

2.2.1 Roadmap for a prospective hospital payment system

Already in 2010, KCE published a report on the (mainly technical) feasibility of introducing a case-based payment system for hospitals in Belgium.¹³ One of the first initiatives that were taken at the political level towards a case-based hospital payment system in Belgium, was the 'Roadmap for a prospective hospital payment system, based on pathologies' in 2013. As part of that roadmap and to prepare the introduction of such system, KCE was asked to assess the DRG-payment system in a selection of countries (England, France, Germany, the Netherlands and the US Medicare



program).⁴ The international experience with DRG-payment systems highlighted several key lessons:

- Concrete decisions regarding the design features of the DRG payment system play a crucial role in determining whether priorities are achieved. Examples are the integration of care settings (day case and outpatient care); services or costs that are not covered by DRG payments but are financed through alternative payment mechanisms; the availability of recent and high-quality cost data; a phased implementation to avoid abrupt budget shifts between hospitals; the establishment of a DRG institute to manage the system, collect data and calculate costs.
- The objectives of a DRG-based payment system should be clearly defined at the moment of introduction.
- Complementary payments are needed to achieve the stated objectives. No single payment system can achieve all objectives.

As a second step of the roadmap, KCE was commissioned by the minister of Public Health (minister Onkelinx; 2007-2014) to propose a framework for a reform of the hospital landscape and payment system in Belgium (KCE report 229).¹⁴ The report put forward the following recommendations for a payment reform towards a DRG-based payment system:

- A tariff per DRG for all care-related components of the current hospital budget (including the practice costs of medical specialists), based on actual costs.
- Excluded from the DRG tariff: high-cost drugs and medical devices; mental health and rehabilitation care; specific role of university hospitals (such as research and education); complex cases with a large variability in costs.
- The DRG-based payments per case are applied to inpatient and day cases, with a single tariff for both types of care for homogeneous groups.

To maintain control over the macro-level hospital budget, it was recommended to assign a specific case quota to each hospital. For these allocated cases, hospitals would be assured the full predetermined DRG tariff. However, for cases exceeding this quota, financial responsibility would gradually shift to the hospital, with a reduced DRG payment as 'overproduction' increases. This proposal, however, was not fully elaborated in KCE report 229.

2.2.2 Action plan with three payment clusters

In April 2015, the minister of Public Health (minister De Block; 2014-2020) proposed a comprehensive reform of Belgian hospitals.¹⁶ A key element of her Action Plan was to classify hospital stays into three clusters depending on the predictability of the care process. Each cluster of hospital stays has a distinct payment system based on financial risk-sharing between the payer and the hospital.

The clusters are as follows:¹⁰

- Low variability cluster: for standard, low-complexity care with minimal variation between patients. Payment is a fixed amount per stay (including the physician fee), regardless of the care provided for each individual stay. Hospitals bear the financial risk for extra care beyond the standard, while the payer bears the risk for the number of cases.
- Medium variability cluster: for hospitals stays that are less predictable than in the first cluster. Payment for these stays is similar to the current system, where a national closed-ended budget is divided among individual hospitals on the basis of justified activities. Physicians are paid per service. The financial risk is shared between the payer (for the physician remuneration) and the hospital (for the budget).
- High variability cluster: for highly complex, unpredictable care. Hospitals are compensated for the care they deliver, with the payer bearing most of the financial risk.



KCE was commissioned to develop a method to define the three clusters and evaluate the feasibility of applying a prospectively determined amount per stay for those classified within the low variability cluster (KCE report 270).¹⁰ In the absence of comprehensive patient-level cost data for at least a representative sample of Belgian hospitals, all analyses were based on prices (reimbursements by RIZIV-INAMI, the National Institute for Health and Disability Insurance) and length of stay. The results of the report played an important role in the introduction of the system of 'low-variable care' on 1 January 2019, which is a prospective lump-sum payment system for medical activities with low variability across hospitals. Low-variable care refers to treatments and hospital stays that have relatively predictable costs and treatment processes, such as certain routine surgeries or standard medical procedures. A lump-sum payment was introduced for 57 groups, known as patient groups, set at the median value of physician fees per hospital stay. The 57 groups fall within 33 APR-DRGs, as some APR-DRGs were divided into subgroups based on specific inclusion and exclusion criteria. This system includes only severity levels 1 and 2. For certain groups, the same payment applies to both inpatient and day cases, while for others, the amount differs between the two. In some groups, only inpatient stays are covered, in others only day cases, and in some, both types are included.

The initial inclusion of physician fees was intended as the first step in minister De Block's reform plans. The gradual incorporation of other elements, such as drugs (excluding high-cost drugs) and operating costs for both inpatient and day cases, was planned but not implemented.

Towards a DRG-based tariff per case

As mentioned above, the current minister of Social Affairs and Public Health (minister Vandenbroucke; since 2020) has the intention to move towards a DRG-based tariff per case. In his reform plans it is stipulated that the current payment system will be replaced by a case-based payment, based on costs.⁶ One of the lessons learned from international experience is the importance of the availability of high-quality and recent cost data.⁴ However, in Belgium there is currently no compulsory collection of patient-level cost data.

This tariff per APR-DRG/SOI will, according to the reform plans, include care-related components currently financed by the BFM, pharmaceuticals, medical devices and part of physician fees (practice costs). Also in other countries, DRG-type payments are never all-inclusive, but are combined with other types of payments.

Extensive research is currently underway on all the elements required to implement a DRG-based tariff per case, including studies related to the reform of the physician fee nomenclature. This report is part of this research.



3 DRG-BASED HOSPITAL PAYMENT SYSTEMS AND CONTROL MEASURES IN SELECTED COUNTRIES

3.1 Method

3.1.1 Selection of countries

A horizon scanning exercise was carried out to identify a **long list** of countries with a case-based hospital payment system (DRGs or other classification). Only countries where DRG-like classifications are used to pay hospitals (not just as a benchmarking tool or to increase transparency) were selected. We based this long list on Table 1.4 in OECD (2016)¹⁷ and Figure 1 in Milstein and Schreyögg (2024)¹.

The **final selection** of countries was based on whether control mechanisms (such as volume or cost caps) were introduced to secure budgetary control and to avoid an undesirable increase in the number of hospital admissions. A second scanning exercise was conducted to identify eligible countries. The main sources of information were Health System in Transition (HiT) reviews published by the European Observatory on Health Systems and Policies, the Health Systems and Policy Monitor platform, OECD reports and previous KCE reports on hospital payment systems, and snowball searching of the included publications. Given the time constraints of the study, the selection of countries was limited to a maximum of five. Taking into account the above criteria, the following countries were included: Estonia, France, Germany, Hungary and Italy (the Lombardy region).

3.1.2 Selection of experts

Since detailed and recent information on hospital payment systems is often unavailable and fragmented in the international literature, it was chosen to have each country report written by a national expert or team, instead of having one (outsourced) team covering all selected countries. Hence, in each of the selected countries, an expert or a research team was appointed.

To find the most appropriate expert/team, the following sources were consulted:

- Members of the Health Systems Response Monitor of the European Observatory and Health Systems and Policies¹⁸
- Authors of publications found in the horizon scanning exercise
- Contacts in previous KCE reports and personal contacts of the KCE research team.

We refer to the colophon and to the country reports in the [Supplement](#) to this scientific report for the names of the national experts.

3.1.3 Information collection process

To increase coherence and comparability between countries, the KCE research team developed a detailed **template** (see Table 2) with an elaborate table of contents and a short description of each section for the country reports. This template was provided to the expert or team in each studied country.

Each expert/research team was asked to write the country report by means of a search for relevant (grey and peer-reviewed) literature. In addition, information could be obtained via key contact persons in their country.

The structure of the country reports aligns with the topics outlined in Table 2. The KCE research team conducted a transversal analysis of the country reports (sections 3.2 to 3.5). We refer to the [Supplement](#) to the scientific report for the country reports and for references relating to the country information in the following sections.

As noted in section 1.2, the focus of the country reports is on control mechanisms implemented to maintain control over the macro-level budget. To understand how these mechanisms operate, some background on the DRG-based payment system is necessary (such as which services or products are excluded from DRGs). However, the descriptions of DRG-based payments are not comprehensive and do not provide enough detail for a full understanding of each country's system.



Table 2 – Template for country reports

Topic	Short description
Brief overview of the healthcare and hospital sector	• General financing system of healthcare (taxes, social contributions, etc.) and main actors • Type and number of hospitals
Main characteristics of the DRG payment system	• Hospital payment system in place before the introduction of DRGs • General description of the introduction of DRGs (e.g. objectives, share of payment system) • Scope of DRGs (+ evolution since introduction) ○ Inpatient, same-day, outpatient, post-hospitalisation, other? ○ Range of costs included in the DRG system ○ Use of medical and cost data • Number of DRGs (+ evolution since introduction, including the reason for a decrease/increase in the number of DRGs)
Overview of exclusions and their payment method	• Share of hospital revenues covered by DRG payments (+ evolution) • Excluded services, patients, hospitals/departments and their payment system
Control mechanisms	• Detailed description of the system ○ Applied to individual hospitals or to the hospital sector as a whole? Applied to all DRGs or a selection of DRGs? Soft or hard caps? ○ Data and methods used to implement the system ○ How frequently are the mechanisms in effect? What is the time-lag between the data and the application of the mechanism? • Reforms since the introduction of the system ○ Why were the reforms introduced? What were the positions of the main stakeholders in the reform process? • Evaluation ○ What was the impact of the control mechanisms on cost containment, waiting times, quality of care, risk selection of patients, readmissions, upcoding, adoption of innovation, attractiveness of certain specialisms to work in for physicians, financial viability hospitals, etc.? Did the evaluation (or stakeholder reactions) result in changes to the system? ○ Were there implementation issues (data, audit, enforcement of 'control mechanism', etc.)?
Payment reforms	• Which reforms to address deficiencies of the DRG-based payment system have been introduced in your country? Which reforms are ongoing or planned? • What are the main reasons for introducing these reforms? What is the extent of reforms (for example, restricted to certain pathologies, and if so, to which type of pathologies)? Was the implementation via pilot projects or nationwide? • Are the objectives of these new payment models evaluated/reached?



3.2 Basic characteristics of the healthcare system and hospital sector

Healthcare financing system

The countries selected for this report can be classified into two systems according to their financing mechanism (see Table 3): countries with a National Health Service (NHS) system that rely mainly on general taxation to fund healthcare, and countries with a Social Health Insurance (SHI) system relying mainly on wage-based contributions from employers and employees. In Estonia and Germany (SHI countries), the majority of funding still comes from an earmarked payroll tax paid by employers (on behalf of employees) and the self-employed (Estonia) or by employers and employees (Germany). In Italy/Lombardy (NHS country), the main funding sources are national and regional taxes (income and other).

However, the classification in NHS and SHI systems is artificial and hides the complexity of real-world systems using a combination of funding streams. For example, in France (SHI country) a revenue-based tax contribution was introduced in the 1990s which is applied to a broader range of income than just wages (e.g. income from financial assets and investments). In 2022, only a third of revenues for SHI came from payroll contributions, less than a third came from revenue-based taxes and the rest from other taxes (such as alcohol and tobacco taxes). Also in Hungary the share of contributions from employers and employees decreased from almost 98% in 1998 to 66% in 2023, with an increasing participation of the central government budget in financing the health system.

A mix of centralised and decentralised systems

In Germany and Italy, health system governance is decentralised, with responsibilities shared between federal and regional levels. In contrast, Estonia, Hungary and France have a more centralised system, where governance primarily occurs at the federal level.

In **Germany**, the federal level sets the legal framework, while state governments (*Länder*) are responsible for hospital planning and public health services. Most decision-making power within the SHI system is delegated to self-governing bodies, such as associations of sickness funds and providers, which meet in the Federal Joint Committee to detail regulations.

The National Health Service (*Servizio Sanitario Nazionale*, SSN) in **Italy** is highly decentralised, with the majority of legislative and executive powers assigned to the regional level, while the central government takes on a stewardship role. Consequently, the organisation and management of health services fall primarily under regional jurisdiction. Within this context, the region of **Lombardy** has developed its own regional healthcare system (*Sistema Sanitario Regionale*, SSR) with specific features appropriate to the regional context, such as a clear separation of the healthcare provider and purchaser functions (since 1997). Health protection agencies (*Azienda di Tutela della Salute*, ATS), which is the name given to local health authorities, have a planning and purchasing role. They are responsible for the management of contracts with health providers, and the accreditation of public and private hospitals. Health territorial authorities (*Azienda Socio Sanitaria Territoriale*, ASST) deliver health services to citizens.

The organisation and financing of healthcare in **Estonia** is centralised, with the Ministry Social Affairs responsible for health policy development, strategic planning, regulation and stewardship while financing is organised through the Estonian Health Insurance Fund (EHIF). The EHIF is an independent public body responsible for contracting service providers, reimbursing health services and prescription medicines, and covering sick leave.



From the 1990s, responsibility for the provision of health services in **Hungary** was transferred from central to local governments, except for universities and national health institutes. After 2010, a re-centralisation was implemented, placing most hospitals back under central government control. Currently, the Hungarian health system is highly centralised and has a single Health Insurance Fund (HIF, NEAK in Hungarian), which provides healthcare coverage for the entire population. In this single-payer system, the central government plays a central role. The HIF is administered by the National Health Insurance Fund Administration (NHIFA).

Although health policy and regulation of the healthcare system is centralised in **France**, there is an increasing role for the regional level with regional health agencies (*Agences Régionales de Santé*, ARS) being responsible for ensuring that healthcare provision meets the needs of the population.

Hospital ownership

The hospital landscape is largely different across the five countries. However, as regards hospital ownership, all countries have a mix of public and private hospitals.

France has a large hospital sector (2 989 hospitals in 2020), of which 45% are public, 22% private not-for-profit and 33% private for-profit providers. Amongst these, 1 816 (61%) provide post-acute and rehabilitation services (*Soins de suite et de réadaptation*, SSR) which are short-term rehabilitation and medical support services, mainly after a hospitalisation, and about 611 (20%) provide psychiatric or mental health services. Public hospitals have specific public service obligations, including equal access to care for all. Private not-for-profit facilities contract with the SHI and are funded similarly to public hospitals if they adhere to these key principles of public services. Most of these facilities are specialised in a few selected medical areas, such as cancer care. Private for-profit hospitals play an essential role in providing surgery. Territorial coordination of hospital care has been reinforced by the introduction of local hospital groups (*Groupe hospitaliers de territoire*, GHT) in 2016.

Also **Germany** has a large hospital sector, with 1 893 hospitals in 2022, of which 539 (28%) are public hospitals, 598 (32%) private not-for profit and

756 (40%) private for-profit hospitals, with bed shares of 40%, 28% and 32%, respectively.

Estonia has 20 publicly owned hospitals, which are part of the hospital network development plan (HNDP). These hospitals are entitled to long-term contracts with the EHIF and are eligible for state investment. There are also public hospitals which are not part of the HNDP as well as private hospitals. They have to compete for a contract by means of a tender process. In 2023, the HNDP included three regional, four central, 11 general and one local hospital, and since 2018 also one rehabilitation hospital. The difference between hospital types is based on the size of the catchment population and the scope of practice.

Also **Lombardy** has a mix of hospitals: public (106) and accredited private (92) hospitals, of which 99 are acute hospitals. There are also 6 public and 14 private scientific institutes of research, hospitalisation and healthcare, some of which are considered acute care hospitals.

The large majority of hospitals in **Hungary** are public hospitals. Only hospitals that have a contract with the NHIFA receive public funding. Most private hospitals do not receive public funding. Some have a contract with the NHIFA to provide specific services, such as day surgeries. Private hospitals are small facilities with 20 or less beds.

3.3 Introduction of DRGs

DRG-based payments differ across the studied countries: they have different classification systems, the scope of DRGs is different, and also the combination of DRGs with other payment types (global budgets, per diem payments, fee-for-service (FFS) payments, etc.) is not the same. These differences can partly be explained by the way hospitals were funded before the introduction of DRGs and by the objectives of introducing DRGs (see Table 3).



3.3.1 *Hospital funding before the introduction of the DRG-based payments*

DRGs replaced fee-for-service systems, per diem rates and global budgets

The most common hospital payment systems before the introduction of DRGs were FFS systems, per diem rates and global budgets. In **France**, prior to the introduction of DRGs in 2005, public and private hospitals were compensated through different payment methods: public and private not-for-profit hospitals received global budgets based on historical costs and private for-profit hospitals were paid by an itemised billing system (including per diem rates covering the cost of accommodation, nursing and routine care, etc. with separate bills for costly drugs and medical devices).

Also in **Italy** (and Lombardy), public and not-for-profit private hospitals on the one hand and private for-profit hospitals were funded differently before the introduction of DRGs in 1995. Public and not-for-profit private hospitals received a global budget that was based on historical expenses, regardless of individual hospital activity. Private for-profit hospitals negotiated with the government a predetermined budget, with price or volume controls, which was based on a detailed cost calculation of the services provided by each hospital.

Before the introduction of DRGs in **Germany** in 2003, operating costs of hospitals were mainly funded via a system of prospective budgets with per diem charges determined by an agreed number of patient days.

In **Estonia**, fee-for-service payments and per diem rates were the main payment methods for inpatient care before 2004. However, already in the 1990s there was a movement away from FFS with the introduction of so-called 'complex prices' for several well-defined surgical diagnoses such as appendectomy, hip and knee replacements and normal childbirths in 1998. This country-specific case-based system contained about 50 complex prices in 2004, representing only a small share of the total inpatient budget.

Before the introduction of the DRG system in **Hungary** in 1993, hospitals were funded primarily through global budgeting. Hospital budgets were the

result of negotiations between the (local) government representatives and hospital management. Funding was based on historical budgets and not tied to patient volume or treatment complexity. The number of hospital beds was used as a basis for budget allocation, leading to significant overfunding for certain institutions compared to others. As a result of these reimbursement methods, hospitals across Hungary showed notable disparities in financial status, quality of care, and accessibility.

Close link between objectives of DRG system and previous payment system

While the five countries share some common objectives in introducing a DRG-based hospital payment system, differences in the hospital payment system in place before the introduction of DRGs have also resulted in differing objectives (see also Table 2 in the synthesis of KCE report 207⁴).

In all countries, a primary goal for implementing DRGs was to enhance efficiency. Other common objectives were improving transparency and accountability of hospital activity, and achieving a fairer allocation of resources (improving equity or creating a 'level playing field'). The introduction of DRGs in Estonia was also seen as a way to contain costs and limit volume growth. However, increasing transparency was not considered a major objective of DRGs, because there already was a clear view of hospital output due to the FFS and per diem payment methods, as well as the availability of detailed patient-level data. Improving quality was only mentioned in France and Germany.

A gradual introduction of DRG-based payments to limit the financial impact for hospitals

To facilitate the transition to the new financing method, DRG-based funding was implemented gradually over several years (in most cases four to six years). In most countries, the transition period extended beyond initial expectations. During this time, the proportion of activities funded through DRGs increased, hospital-specific cost data were progressively replaced by national averages, the system shifted from a budget-neutral phase to one



where hospitals assumed real financial responsibility, or DRG funding was extended to other care settings, such as day cases and outpatient services.

The DRG classification in **France** was initially introduced for reporting hospital activity and only gradually for financing purposes. The share of all activities in public hospitals paid by DRGs increased gradually from 10% in 2004 to 25% in 2005 and reached 100% in 2008. Private-for-profit hospitals have been paid entirely by DRGs since February 2005. Both for public and private hospitals a transition period was in place until 2012, where 'national prices' were adjusted for each provider, considering its own historical costs/prices.

Also in **Estonia**, DRGs were first introduced as a grouping tool, and only later as a payment tool (in 2004). DRGs were implemented gradually to mitigate the risk of technical problems and financial impact for providers and the EHIF. Moreover, contrary to the other studied countries, the reimbursement rate of the DRG tariff has never been 100%. The rate gradually increased from 10% in 2004 to 70% since 2009. This means that 30% of the national tariffs is paid by FFS and per diem payments for services performed during the hospital stay or day surgery treatment.

The DRG system in **Germany** evolved from a budget-neutral phase and hospital-specific base rates (2003-2004) to a convergence phase with state-wide base rates and a gradual abolishment of budget neutrality for individual hospitals (2005-2009). In 2010, a uniform price system at the state

level became effective. While the cost weight is determined at the federal level, the base rates are negotiated by regional hospital associations and health insurers at the state level. The base rate is the same for all hospitals within a state but varies between states, mainly because of historical reasons.

In **Italy**, DRGs were introduced in 1995. The year before the introduction, DRGs were tested in selected hospitals and regions before being expanded nationally. This phased approach allowed hospitals to adapt to the new system, standardise coding practices, and assess how DRGs could best support efficient resource use and equitable reimbursement.

Hungary was the first European country to introduce a DRG-based hospital payment system per case (in 1993). The phased introduction of DRGs was implemented in three stages. In the period 1993-1997, hospitals had different DRG tariffs reflecting prior budget allocations. Eliminating these disparities overnight by introducing a single DRG tariff would have led overfunded hospitals into financial crisis. The second phase of DRG implementation introduced a nationally standardised DRG base rate (in 1998), replacing the previous institution-specific rates. The third phase began with the introduction of the Performance Volume Limit (PVL) in 2004 (see section 3.5.2), which significantly altered the previously established, nationally uniform base rate.



Table 3 – Basic characteristics of the healthcare and hospital sector in selected countries

	Estonia	France	Germany	Hungary	Italy/Lombardy
Healthcare financing system	SHI	SHI	SHI	SHI	NHS
Centralised/decentralised	Centralised	Centralised	Decentralised	Centralised	Decentralised
Hospital ownership	Public (60%) Private (40%)	Public (45%) Private not-for-profit (22%) Private for-profit (33%)	Public (28%) Private not-for-profit (32%) Private for-profit (40%)	Mainly public Small number of private for-profit	Public (54%) Private for-profit (46%)
Previous hospital funding	Fee-for-service and per diem payments	Public and private not-for-profit hospitals: global budgets, based on historical costs Private for-profit hospitals: itemised billing system	Per diem rates with global budgets	Global budgets based on historical costs	Public hospitals: global budgets, based on historical costs Private for-profit hospitals: budget based on cost accounting
Objectives of case-based payments	Improve efficiency Cost containment Limit volume growth	Improve efficiency Create more equitable payment system Improve transparency Increase accountability Improve quality	Improve efficiency Create more equitable payment system Improve transparency Reduce overcapacity Improve quality Increase competition Increase access	Improve efficiency Improve equity Improve cost-effectiveness Cost containment Improve transparency	Improve efficiency Improve equity Improve consistency with health planning objectives Improve cost-effectiveness of healthcare
Introduction year of case-based payments	2004	2004/2005	2003	1993	1995
Name of DRG classification system	NordDRG	<i>Groupe Homogène de Malades (GHM)</i>	(a)G-DRG	DRG (HBC in Hungarian)	DRG
Number of groups	Year of introduction: 496 (inpatient care only) 2024: 806	Year of introduction: 600 2023: 2 600	Year of introduction: 664 2024: 1 296	Year of introduction: 435 2024: 761	538

Notes: SHI = Social Health Insurance; NHS = National Health Service; HNPD = Hospital Network Development Plan



3.3.2 How are DRG tariffs set?

DRG tariffs are typically set through a process that considers costs, clinical complexity and resource usage. While the specific methods can vary, the general approach usually involves the following steps:

- Cost data collection and analysis, with costs provided by (a sample of) hospitals. Cost data help ensure that DRG tariffs reflect the actual resource consumption associated with treating specific patient groups. In some countries, regional differences in costs are accounted for.
- Collection and analysis of patient data and clinical information to categorise cases into DRG groups.
- Calculation of the cost weight per DRG to determine the relative resource use of each DRG.
- Calculation of the base rate which represents the average cost per case for the entire system (but can deviate from the average cost to take account of budget limits). The DRG tariff is equal to the base rate x cost weight.
- Adjustment of the hospital payment to take account of outliers, high-cost cases, etc.

Hence, DRG tariffs in hospital payment systems are set through a detailed, data-driven process to reflect costs and resource use of specific patient groups. Countries vary, however, in how they calculate tariffs, cost weights and base rates, as well as in how they apply adjustments.

In **Estonia**, activity-based costing is used to determine the DRG tariffs. Investment costs of medical technology and depreciation of premises are included in the tariff. Costs related to training new medical staff (for example, resident salaries) are compensated separately. Prices are maximum prices, and prices negotiated in contracts between the EHIF and providers can be lower. Prices are determined on an annual basis. Cost data for 'activities of medical nature' are provided by all relevant hospitals (not all hospitals provide all services); overhead costs are collected from five reference

hospitals. However, prices do not necessarily cover the full cost of the estimated need as the EHIF also needs to consider the budget availability.

Cost data in **France** are based on an annual national cost study (*Etude Nationale de Coûts*, ENC), which collects detailed cost information for each hospital stay from a sample of hospitals participating on a voluntary basis. There is a separate ENC for public and private not-for-profit hospitals versus private for-profit hospitals. In 2023, the ENC sample reached a total of 151 hospitals with 67 public and private not-for-profit and 83 private for-profit hospitals, representing about 16% of total hospital admissions in France. However, the reliability of the ENC studies has been questioned regularly, mainly because of the small sample size and lack of representativity of the participating hospitals.

DRG tariffs are set at the national level, but tariffs vary between public (and private not-for-profit) and private for-profit hospitals. Tariffs are based on reference costs per DRG (*Groupes Homogènes de Malades*, GHM), using the ENC. The public sector tariffs include all costs linked to a stay (including medical personnel, all tests and procedures, etc.), while those for private sector for-profit hospitals do not cover medical fees paid to doctors and the cost of biological and imaging tests (scanner, etc.) which are billed separately. Since overhead costs (financial and building costs) are included in the tariffs in both sectors, hospitals have to fund capital investments from operating revenue. The number of DRG tariffs (*Groupes Homogènes de Séjours*, GHS) in each sector increased by 60% approximately between 2009 and 2022, while the increase was only 15% for the number of GHMs. At the end of 2022, there were more than 7 300 DRG tariffs in total (3 698 for public hospitals, 3 626 for private for-profit hospitals), resulting in a very complex system. About one-third of all DRG tariffs are rarely or never used.

The Ministry of Health sets the final tariffs, which differ from reference costs (raw tariffs). These raw tariffs are adjusted to reflect national health priorities and align with the overall budget and expenditure targets (see section 3.5.1).

DRG tariffs in **Germany** only cover operating costs. The cost of hospital-based specialists is covered by the hospital's DRG. Infrastructure investments, including medical equipment and IT, and research and education are financed by the states. However, due to an underinvestment



of infrastructure, hospitals have been relying on high activity levels and DRG reimbursement, or they have been postponing necessary renovations. Cost weights are calculated annually by the German National Institute for the Reimbursement of Hospitals (InEK) based on case-based cost data, which are collected by a sample of German hospitals. The number of hospitals providing data has been steadily increased to make the sample more representative. In 2022, 276 voluntary hospitals provided cost data, which are used to calculate the DRG cost weights. There is a time lag of two years between the collection of data and tariff updates. The state base rate is negotiated annually between the hospital and health insurer associations. The DRG system applies to all hospitals, irrespective of ownership status.

The last update of the national DRG tariffs in **Italy** was done in 2012. The update was based on a group of 41 public and private hospitals of various sizes, located in seven different regions. These hospitals were chosen by their respective regions, and each selected hospital contributed to the study by providing its own activity and cost data for the 2009 financial year, all collected using a standardised method. Although regulatory guidelines call for triennial updates, the maximum tariffs set in 2012 remain in effect to this day. The DRG tariff is an all-inclusive tariff, covering 'standardised' facility costs, remuneration of all medical professions (physicians, nurses, physiotherapists, etc.), consultations, diagnostic tests, operating theatre, daily consumption of common drugs, etc. Also consultations during hospitalisation and medical examinations provided 30 days before and/or after hospitalisation are included in the DRG tariff. Pre- or post-hospitalisation services must be provided by the same inpatient facility and are typically conducted within 30 days before or after the hospitalisation. Costs related to maintaining healthcare infrastructure and investments in new facilities are funded through separate expenditure items.

Regions have the autonomy to determine the local DRG reimbursement. National tariffs serve as the maximum reimbursement for services when planning the national health budget; if exceeded, the additional cost must be covered by the regional budget. Economically stable regions are allowed to adjust the national tariffs by a specific percentage or to keep the national cost weights but adjust the base rate of (some) DRGs. This flexibility is granted to ensure that regions with better financial health can optimise

healthcare service costs while maintaining overall budgetary discipline. Regions under financial control have to apply the national tariffs.

Since adopting a different financing system apart from the nationally mandated DRG system was not feasible, the regional government in **Lombardy** gradually implemented coding rules and additional reimbursement requirements. Tariffs for low-yield specialties such as paediatrics, obstetrics, and psychiatry were increased as well as for clinically appropriate day surgery procedures. DRG tariffs have been periodically adjusted on the basis of regular surveys of production costs. The most recent comprehensive update of the regional tariff took place in 2014. Data from public facilities and from 75 private hospitals were collected and processed. The 2015 tariff scheme includes about 200 DRGs with a higher tariff (mainly in the areas of cardiac surgery, thoracic surgery, orthopaedics, gynaecology) and 270 DRGs with a lower tariff than the national tariff. Tariffs are identical for all hospitals (private or public, small or large). From 2015 onwards, the regional government introduced further classifications within each DRG to differentiate the provided healthcare services and the different associated costs.

In **Hungary**, the cost weight is set at the national level and is based on a detailed cost analysis from a sample of hospitals. Calculations are carried out by the NEAK. The base rate is set as part of the budget planning process. It is reviewed periodically to reflect budget constraints, inflation, and policy adjustments in the healthcare sector. The base rate does not sufficiently cover costs. This issue is frequently cited as a cause of hospital debt and suboptimal quality levels. The tariff (cost weight x base rate) is applied uniformly to all public hospitals that have a contract with the NHIFA, irrespective of size, location, etc. For volumes exceeding the agreed activity level (see section 3.5.2), the base rate is reduced.

Investment costs are not included in the DRG tariff. The state and other owners are responsible for funding investment costs, including the hospital's infrastructure (such as purchasing operating rooms, sterilisation and anaesthesia equipment), renovations and upgrades (e.g. for comfort and air conditioning), and the acquisition of high-value diagnostic and therapeutic equipment, assets, and surgical beds (e.g. CT and MRI machines,



laparoscopic towers, ventilators). DRG tariffs include the costs of all personnel, also the remuneration of medical specialists. However, since 2017, hospitals receive a wage subsidy for salary increases, paid monthly

in addition to the DRG payment. Since 2021, this fixed payment has accounted for over 20% of total hospital payments.

Table 4 – Cost data collection in selected countries

	Estonia	France	Germany	Hungary	Italy
Sample size	Voluntary participation Medical activities: selected hospitals Overhead costs: 5 reference hospitals	Voluntary participation of 151 hospitals	Voluntary participation of 276 hospitals	18-40 hospitals	41 hospitals
Inclusion of investment costs in DRG tariff	yes	yes	no	no	no
Inclusion of remuneration of medical specialists in DRG tariff	yes	yes for public and private not-for-profit hospitals no for private for-profit hospitals	yes	partly	yes

3.4 Mechanisms to reduce variability within DRG groups

To reduce variability within DRG groups and refine hospital financing, countries implement several strategies. The most common are increasing the number of DRG groups to account for different patient complexities and treatment variations (section 3.4.1) and excluding cases (for example, high-cost or complex cases), hospitals, departments, etc. and outliers from standard DRG payments (section 3.4.2).

3.4.1 Number of DRG groups

The number of DRG groups varies significantly across countries. The number generally reflects the scope and types of hospital care included within the DRG system. However, comparisons should be interpreted with caution, as in some countries the number of DRG groups is (significantly) smaller than the number of tariffs, which are designed to account for factors like severity and length of stay (for example, in France).

In **Estonia**, acute inpatient cases, day cases as well as outpatient visits are included in the DRG classification system. However, only inpatient cases and day surgery are reimbursed by DRGs. Outpatient visits and medical day cases are funded on a FFS basis. In 2004, the initial number of DRGs was 496, covering only inpatient care. This number increased to 786 when DRGs



were also defined for outpatient visits and day surgery. In 2024, the system includes 806 DRGs (there are no subgroups based on, for example, complexity).

In **France**, DRG-based payments cover all acute care facilities (public, private not-for-profit and for-profit) providing inpatient and ambulatory care, including home hospitalisations. Inpatient and day cases (medical and surgical) are reimbursed by DRGs. For example, treatments such as dialysis, chemotherapy and radiotherapy are included in the DRG system. The number of groups increased from 600 in the year of introduction (2004/2005) to about 2 600 in 2023. This increase is mainly explained by the introduction of four levels of case severity in 2009 and the distinction between ambulatory (< 1 day) and very short (< 2 days) stays. The large number of groups makes the French system highly complex for the users but also raises questions about the statistical validity of costs per DRG calculated on the basis of a few cases.

Also in **Germany**, inpatient and day cases (medical and surgical) are reimbursed by DRGs. Due to ongoing diversification, the number of groups increased from 664 in the year of introduction (2003) to 1 296 in 2024 in Germany. Medical associations, hospital and sickness fund associations develop recommendations for further development of the system, for example because the patients within a given DRG are too heterogeneous regarding costs. Some DRGs are split in subgroups to reflect differences in patient complexity, resource usage, and severity of cases. Not all DRGs have subgroups, simpler cases or those with predictable costs may remain as single DRGs without further subdivision. However, many do (about 70-80%), particularly in areas where there is significant variation in patient care needs. These subgroups, called severity levels or complication and comorbidity (CC) levels, are designed to more accurately match payment to the level of care required for different cases.

Since DRGs were introduced in **Italy** for inpatient and day cases, the total number has remained constant at 538 groups. However, the number of tariffs associated with each of the 538 DRGs can vary based on several factors, including length of stay, complexity, and type of facility (public or private). Therefore, four different tariffs are possible, but not all DRGs have

four tariffs. Moreover, regions are allowed to introduce further classifications within each DRG (see section 3.3.2 for Lombardy).

At the time of the introduction of DRGs in **Hungary** in 1993, there were 435 DRG groups. The current version (as of November 2024) contains 761 DRG groups. Inpatient and day cases (medical and surgical) are reimbursed by DRGs. The main reasons of the increasing number of DRG groups during these 31 years are: widespread adoption of existing health technologies (e.g. CT, MR examinations); emergence of new health technologies in clinical practice (e.g. coronary stents, implantable medical devices, robotic surgery, etc.); withdrawal of outdated medical technologies; spread of same-day surgical services and changes in the cost structure.

3.4.2 Scope of DRG-based hospital payments

There is no country where all hospital care is covered by DRGs. Countries vary, however, in their use of exclusion mechanisms (see Table 5 for a non-exhaustive overview). The scope of DRG-based hospital payments refers to the hospitals, hospital departments, services and patient groups that are funded with this type of payment system. Typical exclusions are rural hospitals; emergency, long-term and rehabilitation care; high-cost drugs and medical devices; complex cases and outliers. Most countries have a variety of additional payment streams for hospital care that is excluded from DRG-based payments. In Estonia, all exclusions are reimbursed based on fee-for-service (FFS) or per diem rates.

Excluded hospitals

In **Estonia**, one of the HNBP hospitals is located on a small island with a population of less than 10 000 people. Previously used payment methods such as FFS, DRGs and per diem rates were not sufficient to cover fixed costs. Therefore, this hospital now receives a global budget as the main payment mechanism. General and local hospitals have faced difficulties in meeting contract volume requirements. To address this, since 2014, the EHIF has allowed these hospitals to adopt an alternative payment method, where 50% of payments are made as a budget and the remaining 50% continue under the DRG-based system.



In **France**, acute psychiatric hospitals and post-acute and rehabilitation facilities are not funded through DRGs. Both types of hospitals have a mixed funding model consisting of a population-based allocation, an activity-based part and a quality-based payment. Also community hospitals (small local hospitals) are no longer part of the DRG-based payment system due to their low activity levels and geographic remoteness, which led to financial deficits. Since 2021, they receive a global budget.

Also in **Italy**, long-term or territorial rehabilitation facilities are remunerated according to a daily rate. Post-inpatient rehabilitation is remunerated according to DRGs.

Special institutions, which can be either a part of a hospital (e.g. one or multiple departments) or the whole hospital, can be excluded from the DRG reimbursement in **Germany**. The special institution status can be granted in several ways. For example, if more than half of all patients reached the upper LOS threshold for their respective DRG; for palliative care units that have at least five beds; or for hospitals or wards that focus on youth/children's rheumatology or the treatment of tropical infections. For hospitals/wards with a special institution status, payments are negotiated and can be either case- or LOS-dependent.

Hospitals with low patient numbers are not excluded from the DRG system in Germany, but receive subsidies that are paid on top of the regular DRG payment on a case-by-case basis. This ensures hospitals to maintain necessary services like emergency care, obstetrics, gynaecology, and paediatrics. Rural hospitals receive an annual lump-sum allowance regardless of financial deficits. The amount of the allowance increases based on the number of essential departments.

Only hospitals that have a contract with the National Health Insurance Fund Administration are funded in **Hungary**. These are mainly public hospitals. Special medical services offered in public hospitals to self-paying patients who opt for faster or enhanced care outside the standard public healthcare system are also excluded from DRG payments.

Excluded hospital departments

The hospital departments most commonly excluded in the studied countries are: emergency care, psychiatric care, rehabilitation care and long-term care (see Table 5). In **France**, for example, the payment model for emergency care consists of a population-based global allocation which is calculated considering the patient outflow, mortality and morbidity rates in the local area (53%), an activity-based payment with fees adjusted by the intensity of care (depending mainly on patient age and the level of care provided) (45%), with a small P4Q component (2%).

In **Lombardy**, 23 functions have been defined, of which 14 are related to hospital care. Some of them are excluded from DRG payments, for other functions hospitals receive additional payments on top of DRG-based payments. Functions can be related to a hospital department, to products or services, or to patient groups. They were identified based on assessments of the degree of complexity and the organisational requirements to provide certain types of care (e.g. emergency public network), cost-accounting assessments of loss-making departments (e.g. paediatrics), economic assessments of time-dependent networks (e.g. stroke or acute myocardial infarction). National legislation mandates that remuneration per function must be capped at 30% of each healthcare facility's funding. Different payment methods are applied for these functions. For emergency care, hospitals are reimbursed a predetermined tariff based on the level of the emergency department. A higher payment is provided for rural or specialised hospitals (e.g. cardiological or orthopaedic emergency room). An additional tariff is added based on volume of care.

Excluded products or services

Most common reasons to exclude specific products or services from the DRG-based payment system are:

- high level of costs (drugs, medical devices);
- infrequent occurrence within a DRG;
- provided only by a limited number of providers.



In all countries, high-cost drugs and medical devices are excluded from DRG payments. In most cases, they are reimbursed per product.

In **Germany**, excluded products and services are reimbursed separately via additional fees (*Zusatzentgelte*). A distinction is made between rated (priced) and unrated (hospital-specific) additional fees. Rated (priced) additional fees have a monetary value and the price applies to all hospitals. Unrated (hospital-specific) additional fees for which the determination of a payment amount was not possible (e.g. due to insufficient data) are to be negotiated individually with the relevant hospitals. In 2019, additional fees for excluded products or services accounted for 4.2% of overall hospital revenues. For new treatments or diagnostic services, providers and sickness funds can negotiate payments on a per-case basis.

Excluded patient groups

In all countries except France also patient groups (DRGs) are excluded from the DRG payment system. In Germany, for example, these groups include organ transplants, severe burn treatments, and early rehabilitation for specific severe conditions like nervous system disorders, cardiovascular diseases, and polytrauma cases. In 2024, this concerned 42 patient groups without a cost weight. Hospital-individual reimbursements are negotiated with sickness funds for excluded patient groups. For psychiatric and psychosomatic cases, hospitals receive a per diem amount which decreases with an increased LOS.

Excluded staff groups

In 2020, the nursing staff costs for direct patient care on wards with beds have been separated from the DRG flat rates per case in Germany (see section 3.6.2). Nursing staff costs are now financed via a hospital-specific nursing budget. The nursing staff costs to be excluded from DRG payments were published in a catalogue with standardised national valuation ratios per full or partial inpatient occupancy day. The full cost of nursing staff is covered. Since the introduction of the new financing system, the G-DRG system is referred to as aG-DRG system ('a' for outsourced or *ausgegliedert*).

Exclusion of outliers

DRGs always incorporate patients that require much more resources than most patients belonging to the same DRG. Therefore, in addition to the exclusions in Table 5, all countries also exclude outlier cases. Outliers are cases with costs or a length of stay below or above a trim-point. For the exact definition, we refer to the [Supplement](#) to this report.



Table 5 – Scope of DRG-based hospital payments in selected countries (2024 or latest available year)

	Estonia	France	Germany	Hungary	Italy/Lombardy
% of hospital funding via DRG payments	31-46%	64.2%	80%	30-40%	30%
Day cases (medical/surgical)	Surgical only	Medical and surgical	Medical and surgical	Medical and surgical	Medical and surgical
Excluded hospitals	One hospital located on a small island Hospitals without a contract with the EHIF Long-term care facilities	Community hospitals Hospitals for prisoners Post-acute and rehabilitation facilities Psychiatric hospitals Long-term care facilities	Special institutions	Hospitals without a contract (mostly private hospitals)	Rehabilitation facilities
Excluded hospital departments	Psychiatric care Rehabilitation Follow-up care Occupational diseases Tuberculosis	Long-term care Emergency care	Emergency care	Long-term care Rehabilitation	Emergency care Trauma centres Burn centres Occupational diseases Tuberculosis
Excluded products/services	High-cost drugs High-cost medical devices Outpatient visits (endoscopic services, minor surgery etc.)	Education, research, innovation, and other activities of public interest High-cost drugs High-cost medical devices	New treatments or diagnostic services 161 excluded services or products: • Implantable medical devices • Complex therapies • High-cost drugs • High-cost medical devices	High-cost drugs High-cost medical devices	Research and training New-borne care ECMO treatment
Excluded patient groups	Outpatient DRGs without cost weight Chemotherapy Transferred patients Organ transplants	/	Psychiatric and psychosomatic cases 42 DRGs without cost weight: • Organ transplants • Severe burn treatments • Early rehabilitation for some severe conditions	Organ transplants	
Excluded staff groups	/	/	Nursing staff	/	/

EHIF = Estonian Health Insurance Fund; ECMO = extracorporeal membrane oxygenation



3.4.3 Share of DRG-based payments

The scope of DRGs and the share of DRG-based payments in hospital funding are closely linked because the breadth of services covered by DRGs influences how much hospitals rely on DRG-based payments as a revenue source. The share of DRG-based payments in total hospital payments ranges from 30% (Lombardy) to 80% (Germany before the recent reforms).

In **Estonia**, the share of DRG-based payments has ranged between 31% and 46% since the introduction of DRGs in 2004. Changes in the scope of DRGs, the amount of outliers and the use of digital technologies which facilitated the automated production of invoices by providers explain the variation over the years. The share also varies across hospital type, and depends on the range of services that are provided.

In **France**, the share of revenue generated by DRG payments was 64.2% in 2019, but this share ranged from 59.2% for regional/teaching hospitals to 81.4% for private for-profit hospitals.

Before the recent reforms in **Germany** (see section 3.6.2), DRGs represented approximately 80% of all financial resources of hospitals.

Based on data from the budgets of the eight ATs, the share of DRG payments in total healthcare-related payments for hospitals in **Lombardy** is approximately 30%.

In **Hungary**, DRGs contribute to 30–40% of total hospital revenues. However, within acute inpatient care, they account for 50% of the revenue, with the remaining 50% coming from targeted funding for wage increases.

3.5 Mechanisms for controlling the budget

Under activity-based payments, hospitals have an incentive to increase activity which might lead to budget overruns and unsustainable expenses. In this section a detailed description is given of the control mechanisms (via volume or tariffs) that were installed in the five studied countries to avoid an increase in expenses, for example due to an undesirable increase in the number of admissions.

Alongside control mechanisms like volume limits and tariff reductions, countries have also implemented control activities focused on ensuring the accuracy of the data that underpin the DRG system. We refer to the country reports (especially the reports for Italy/Lombardy and Hungary) in the [Supplement](#) for more details.

We first describe whether a national or regional budget for healthcare, particularly for hospital care, serves as a (hard) limit on health spending (section 3.5.1). Following this, section 3.5.2 provides a detailed overview of the control mechanisms in place. Finally, section 3.5.3 evaluates how these budgets are established and how the control mechanisms are applied.

3.5.1 National or regional budget: hard or soft constraint on health spending?

In **France**, the governance of healthcare is a joint responsibility between the government and SHI (or sickness) funds. To manage healthcare spending, the Parliament sets annual spending targets (National Objective for Health Insurance Spending or *Objectif National de Dépenses de l'Assurance Maladie*, ONDAM), separately for ambulatory care providers, for hospitals and for long-term care facilities. A distinction is also made between spending targets for public and private not-for-profit hospitals on the one hand and for private for-profit hospitals on the other hand. While the targets were initially set as objectives, they became binding in 2010 with a dedicated committee monitoring the evolution of health expenditures. The ONDAM is specified in monetary terms as the total amount of spending for the next calendar year. FFS payments for medical specialists in private for-profit hospitals are not included in the DRG payments, nor are they included in the ONDAM targets for acute care. Instead, they are part of the targets for outpatient care. The committee that is responsible for monitoring the evolution of health expenditures alerts the parliament, the government and the SHI funds if the ONDAM target is at risk of being exceeded. When setting the ONDAM target, the government also provides a list of savings that are necessary to meet the budget targets.



The largest part of healthcare expenditure in **Germany** is derived from contributions equally shared by employers and employees. These contributions are paid to the sickness funds, which they transfer to a central reallocation pool, called the *Gesundheitsfonds*. This fund pools all revenues (including a federal government subsidy) and reallocates them to the sickness funds according to a risk-adjustment mechanism. Sickness funds have to cover all expenses of their members with the risk-adjusted transfers from the central reallocation pool. If claims from their members exceed revenue in a given year, sickness funds are obliged to levy supplementary contributions from their members.

Public healthcare in **Italy** is funded through a mix of national and regional taxes, along with contributions from citizens via co-payments for specific services. The budget for the NHS (*Servizio Sanitario Nazionale*, SSN) in Italy is determined by the national parliament and government via budget laws. The national benefits package is defined by the central government and the SSN guarantees the provision of the benefits package across the entire country. Hence, the first step in the process of determining the budget available for healthcare lies with the national government which sets a total health expenditure ceiling for the SSN. In a second step, the national budget, which is mainly based on the macroeconomic framework, is allocated to the regions on the basis of a capitation formula, taking into account age, epidemiological indicators and historical hospital expenditures. In a third step, each region then develops its own regional health budget using its share of the SSN, with the possibility of adding its own additional resources. Regions are allowed to levy regional taxes, for example an earmarked corporate tax on the value-added of companies.

Each region has its institutional and organisational structure and determines the flow of resources within the system. **Lombardy** has developed its own healthcare system (SSR) with 8 Health Protection Agencies (ATs) and 27 Health Territory Authorities (ASSTs). ASSTs provide health services to the population (both hospital care and community-based services) while ATs are local health authorities. Their main task is to manage contracts with providers and to accredit private health providers. The Regional Council in Lombardy must approve the budget document for the allocation, management and monitoring of financial resources. The regional

government allocates and manages the resources according to the approved plan. The resources that are allocated to the 8 ATs are further allocated to the ASSTs, which organise the supply of all public healthcare services delivered on their territory. This allocation takes into account both passive mobility (residents seeking treatment in facilities outside their region or health authorities) and active mobility (when individuals from outside their ATs are treated). The contracted budget is a spending cap for the contracted provider. There can be adjustments based on specific needs or circumstances, such as unexpected increases in demand or changes in national regulations (e.g. during the COVID-19 pandemic). For accredited private providers, two distinct spending caps are identified (one for residents of Lombardy and one for residents outside Lombardy).

In **Estonia**, the available budget for the EHIF comes from an earmarked payroll tax and state transfers. The EHIF pools funds and uses them to purchase healthcare services. Hence, healthcare services are purchased centrally. The relationship between the healthcare providers and the EHIF is based on contracts, and both public and private providers can hold contracts with the EHIF. The EHIF is allowed to selectively contract providers, but has to contract all HNDP hospitals and this for at least 80% of their previous year's actual contract amount.

The budget of the Health Insurance Fund (HIF) in **Hungary** mainly includes social health insurance contributions (collected and pooled into a central fund by the NEAK), direct government transfers and other incomes (for example, a public health tax on unhealthy foods and beverages). Each year, the Hungarian government sets a national budget, which includes an allocation for healthcare. This allocation is influenced by broader economic conditions, tax revenues, and political priorities, such as improving healthcare accessibility or addressing specific health issues.



3.5.2 Volume or tariffs to control hospital expenditure?

In all studied countries, except for France, contracts are negotiated between the payer and provider. In these contracts it is stipulated that DRG tariffs for volumes within the budget or volume target are higher than tariffs for production beyond the target. The contract volumes and tariffs apply at different levels: the hospital level (Germany, Hungary and Lombardy) or specialty level per hospital (Estonia). In some cases (for example, in Lombardy) there is a hard volume cap, which means there is no funding for production beyond the target. The volume-price mechanism in each of the four countries is described in more detail in the following sections. We first describe the system in France.

Tariff reductions at the national level in France

France is the only country of the five selected countries with a hard national budget cap. It regulates by tariffs rather than by volumes. Therefore, when the binding ONDAM budget for private or public hospitals is overrun due to a growth in total hospital volume in a given year, prices (DRG tariffs) are uniformly reduced the following year to stay within the targeted budget. The targets serve as a price regulation mechanism. The growth of activity volumes is not regulated at the individual hospital level but at the national level (separately for the public and private sector). Moreover, if the ONDAM targets are expected to be exceeded, hospital tariffs can be reduced during the year rather than waiting until the end of the year to ensure the target is met. Prices have been adjusted downwards regularly since 2008 until 2019.

Contracts defining volume-dependent tariffs at the hospital level in Germany and Hungary

In **Germany**, individual hospitals negotiate with health insurance funds and conclude a contract defining their activity level (the case mix) and budget for the next year (for all DRGs together). The total hospital budget consists of the following elements:

hospital budget = $\sum$ prospective DRG cost weights (= case mix) x state base rate + priced and unpriced additional fees.

Priced additional fees have a monetary value which applies to all hospitals, while unpriced additional fees are negotiated between the hospital and the health insurance fund.

The negotiations are based on the activity level of the preceding year and changes (for example, a planned increase or reduction of specific services) that are planned. The following control mechanisms were introduced to keep actual volumes of each hospital within the prospectively defined activity level:

- Hospitals receive a surplus compensation for volumes beyond the agreed activity level, which is 65% lower than the DRG tariff for within target volumes (called *Mehrerlösausgleich*).
- Hospitals receive a shortfall compensation for volumes lower than the negotiated case mix, which is 20% of the difference between the negotiated budget and the actual revenue (called *Mindererlösausgleich*).

In addition to a negotiated annual budget per hospital with shortfall and surplus compensations, a second control mechanism has been in place since 2009. From 2009 until 2016, this macro-level mechanism was called additional-volume-deduction (*Mehrleistungsabschlag*, MLA). The mechanism was introduced to control increasing case numbers after the introduction of DRGs. For hospitals that agreed additional service increases (beyond the contract volume) during contract negotiations with the health insurance funds, there was a tariff reduction of 25% for three years for the additional services. In addition, there was a further 'sanction' in the form of a reduction in the state base rate if the volume of services provided by all hospitals in a federal state increased compared to the previous year. This collective liability affected all hospitals without exception, regardless of whether they had an increase in services, or not. The reduced tariff for additional services at the individual hospital level and the collective liability were referred to as 'double degression'.



In 2017, the collective liability and double degression system were replaced by a new system called fixed-cost degression deduction (*Fixkostendegressionsabschlag*, FDA). While the principles of the FDA and the MLA are the same, only hospitals that actually provide additional services are sanctioned with the FDA. Although each state is allowed to set the reduced tariff, the federal legislator has set the discount at 35% for a period of three years due to a lack of agreement between the contracting parties. The economic background of the FDA is to counteract volume-rated efficiency gains (economies of scale) for hospitals providing volumes of care beyond the contract volume. Some services are exempt from the FDA regulation: medical devices, services that are reimbursed via additional fees (priced and unpriced), new treatments or diagnostic services, etc.

Also in **Hungary**, volume-dependent tariffs are applied at the hospital level. The starting point is the annual national upper limit defined by the NEAK. The NEAK contracts with individual providers, including hospitals, outlining the services to be covered, volume expectations and reimbursement terms. The volume allocated to individual providers is based on the population size of the region, type of hospital, etc. Hospitals can plan their monthly distribution of services within their assigned annual volume limits, accounting for seasonal variations in care needs. A uniform national DRG tariff has been in place since 1998. To control activity growth, a volume limit was introduced in 2004, known as the Performance Volume Limit (PVL), which sets an annual cap on hospital activity. The specific implementation of the PVL has been revised multiple times since its inception. From 2004 to 2006, the Hungarian PVL system used a degressive financing model for patient activity above the established limit. During this period, the PVL base was set at 98% of the previous year's activity, effectively reducing the total hospital budget by 2%. Excess activity above the PVL limit was partially funded as follows: a 0–5% increase was reimbursed at 60%, a 5–10% increase at 30%, and anything above a 10% increase at 10%. Between 2006 and 2010, the PVL base was further lowered to 95% of the prior year's activity, with no reimbursement for patient turnover beyond this ceiling. From 2011 to 2012, activity up to 10% over the PVL was reimbursed at only 30% of the announced DRG rate. Since 2013, hospital performance up to 4% above the PVL has been reimbursed at just 25% of the announced DRG reimbursement rate.

While the PVL applies to the majority of inpatient care reimbursed through DRGs, there are exceptions such as emergency events (stroke, AMI), maternity and newborn care. These services are entitled to the full tariff. Moreover, hospitals have several opportunities each year to apply for additional capacity and volume if the allocated volume is insufficient. This is also common when introducing new technologies.

Contracts defining volume-dependent tariffs at the hospital and specialty level in Estonia

In **Estonia**, the primary mechanism for budget control are the contract terms agreed upon between hospitals and the EHIF. The Health Insurance Act determines the framework of the contracts, such as the conditions for access to care, the payment conditions in each care setting or quality of care. The EHIF negotiates the contract terms with provider associations, to guarantee that the contract terms are the same across providers. The contract covers medium-term conditions for five years for HNBP hospitals and at least five years for other selected providers. The financial appendices are individually negotiated with each provider for one year and define payment methods, caps on volumes and costs of care by specialty, agreements on service quality and access, etc.

The contract volumes are based on estimates of expected need by specialty at the county level (15 counties). The EHIF annual needs assessment aims to estimate the demand for each specialty (number of cases) for the persons living in each county in ten-year age groups. The needs assessment is based on historic service utilisation data, waiting times (currently only for outpatient visits), availability of medical doctors for specific specialties in the area, utilisation of primary healthcare, etc. The needs assessment at the county level is then allocated to individual HNBP hospitals. If the HNBP hospitals are not able to cover the need that can be covered with the EHIF budget, the EHIF contracts private providers through a selective contracting process.

Until 2006, there was a hard volume cap per HNBP hospital: the EHIF was not obliged to reimburse services beyond the agreed contract volume. A reform in 2006 obliged the EHIF to cover 30% of 'overprovided' services.



The main objective of the reform was to avoid that patients would have no access to care. In addition, the reform introduced some financial flexibility in the contracts by allowing providers to reallocate up to 5% of the contract sum for specialist care to different specialties. In 2014, the EHIF revised its purchasing procedures for specialist care. Contrary to the previous period, the focus shifted to an assessment of the needs of the population (see previous paragraphs). Moreover, provider flexibility in deciding upon the use of the budget was widened as the reimbursement rules for outpatient and inpatient care were differentiated. These rules include for instance that a provider can use its contracted amount for inpatient care to exceed the contract of outpatient care, but the other way around is not allowed. Each speciality contract amount can be exceeded by 7% in inpatient care as long as the contracted amount has not been reached across specialties. Inpatient care contracts across all specialties cannot be exceeded for more than 2%. The contracts for all providers are capped separately for a six-month period and only twice per year (in May and November) the provider applications are reviewed to make changes in the contract volumes. Third, the reform in 2014 introduced tariff reductions for cases beyond the agreed contract volume. For example, the EHIF covers up to 30% of the invoice for inpatient care (FFS or DRG) and up to 70% for outpatient and same-day treatment when the contract volume is exceeded. For these cases, the EHIF does not guarantee hospitals partial or full reimbursement of the fixed cost component of care. Most of the reforms implemented in 2014 are still in effect in 2024.

The EHIF digitalised claims data allow continuous monitoring of contract data which simplifies the application of, for example, tariff reductions when applicable. Since 2020, the claims can be submitted for reimbursement on an ongoing basis.

Volume cap at the hospital level in Lombardy

In **Lombardy**, the starting point of the negotiations between the Regional Health Agency (ATS) and an accredited public or private provider is the regional healthcare budget (spending ceiling) as defined in the contract. The contracted budget refers to all services delivered by the same healthcare provider, but it can be subdivided by lines of activity (for example, hospital care and outpatient services). Providers must adhere to the remuneration

system, control mechanisms, sanctions, and comply with waiting time regulations set by the regional government. Monthly payments are made by the ATS based on accurately reported services in the regional information system, with penalties for non-compliance ranging from budget reductions of 0.5% to 2% and payment suspensions from three to twelve months.

Provider budget caps have been the basis of the contract, without systematic consideration for minimum or maximum service volumes (except during the COVID-19 pandemic). Hospital care is reimbursed at 100% up to the allocated budget, but no reimbursement is provided for services exceeding the budget or lacking regional accreditation. For outpatient care (reimbursed on a FFS basis), the rules are more flexible. The historical budget is the basis of the so-called '97%' budget. There is full reimbursement up to 97% (of previous year's outpatient budget); between 97% and 103% a maximum rate reduction of 30% (60% laboratory tests) is applied; between 103% and 106% a maximum rate reduction of 60% is applied; above 106% no remuneration is guaranteed. If a healthcare provider does not use its entire contracted budget, the ATS may shift these resources in the last quarter of the year to other providers (public to public or private to private) up to a value of 10% of the budget of the individual provider involved.

Since 2022, accredited private hospitals have had a 7% variable quota in their budgets to address waiting list reductions and provide specific services as determined by ATS based on facility type. Public providers negotiate specific services and targets at the regional level, allowing each hospital to autonomously manage the volume of activities to be delivered.



3.5.3 *Evaluation of the control mechanisms*

The following sections examine whether the control mechanisms successfully limited volume increases driven by DRG-based payments. They also assess the budget and tariff-setting process, as it is closely linked with caps on volume and/or price. There is, however, hardly any robust empirical evidence on the impact of control mechanisms on volume levels. Therefore, most 'evidence' is based on aggregate trends.

Budget-driven tariff reductions create an unclear financial environment for hospitals in France

In **France**, the ONDAM targets for the hospital sector are based on an estimate of the spending trend, which corresponds to the 'spontaneous' evolution of expenditure. Hence, the estimation of the spending trend does not take into account determinants of healthcare expenditure, such as demographics, morbidity, technical progress, etc. Contrary to the primary care sector, no distinction is made between trend and new expenditure for the hospital sector. However, changes in patient behaviour, epidemic-type factors, modifications in medical practice and productivity can influence both volume and expenditure. Growth in the volume of care can only be curbed by structural reforms, the effects of which generally only become apparent in the medium term. Instead, the ONDAM targets are based on a short-term approach that does not take into account the needs of the population and the structural reforms that could improve the efficiency of the healthcare system. Their trend planning relies too heavily on past expenditures, often limited by insufficiently justified savings. Moreover, a control system which is based on compliance with the ONDAM targets is insufficient from a public finance point of view because this may be accompanied by hospital deficits and debts that contribute to the public deficit and debt. Although the ONDAM targets appear to have had some success in containing healthcare spending between 2010 and 2019 (until the COVID-19 pandemic), real expenditure of healthcare facilities has been higher than the amount predicted by ONDAM. The majority of the public hospitals (58%) were in deficit in 2018-2019. Their deficit amounted to 0.7% of revenue (2018 and 2019).

DRG tariffs in France (GHS) are set at the national level, with different tariffs for public and private not-for-profit versus private for-profit hospitals. Price setting considers the overall budget for the acute hospital sector (ONDAM targets) and national health priorities. Since 2008, some DRG tariffs in France have been reduced multiple times due to activity volumes exceeding targets, while others have been raised (without a clear methodology) to align with government public health priorities, such as cancer care. This macro-level price adjustment, leading to a disconnection between prices and reference costs, has created an unpredictable environment, making it challenging for hospitals to predict their budgets, as prices change annually based on overall hospital activity. Although the growth in activity volumes slowed in public hospitals from 2012 onward – where wages, particularly for nurses, remained low and working conditions worsened – private hospitals continued to see high volume growth until the COVID-19 pandemic in 2020.

Individual hospitals have an incentive to increase volume to prevent losing revenue when tariffs are going down. With limited cost and quality data for benchmarking, hospitals focus more on volume than on efficiency or quality improvements. Additionally, underinvestment in public hospital infrastructure has worsened working conditions over the past decade, fuelling resentment toward the DRG payment system.

Volume-dependent tariffs in Estonia and Germany help control the overall number of cases but not the cost per case

The aim of the needs assessment and volume contracts in **Estonia** is to ensure accessibility to essential services at the county level and to transfer speciality services to the competence centres in the regional hospitals, but also to limit the incentive to inflate the number of services. However, as DRG tariffs are based on average costs of the previous year, providers are incentivised to increase the cost per case by adding up more services to each case. One of the cost drivers in inpatient care has been the increasing use of diagnostic tests and technology. Moreover, although the volume contracts are based on a needs assessment, the EHIF also needs to consider the budget availability in the contract negotiations. Hence, the EHIF does not (necessarily) cover the full cost of the estimated needs.



Broadly speaking, the existing financing methods have helped the EHIF to keep the inpatient care budget under control. Smaller hospitals (general and local hospitals), however, have had challenges in filling the contract volumes. Moreover, while the EHIF has been successful in managing its budget, the system failed to control the increasing costs per case. Therefore, the EHIF plans to replace the current system, which uses average costs per case as the primary basis for contract planning, with a new approach that focuses on monitoring the total contract amount and the number of people served. The main aim of the new approach is to serve as many people as possible within the contract amount and to limit the incentive to inflate the cost per case.

Aggregate trends in **Germany** suggest that the average length of stay has decreased since the introduction of DRGs in 2003, but this decreasing trend already started before 2003 (and was even more pronounced before 2003 than after the introduction of DRGs). The number of cases increased, along with hospital expenditures. Hospitals face financial pressures to increase the number of cases beyond what is medically necessary to finance infrastructure costs that are only partially covered by the states. While other OECD countries saw a decline in the number of inpatient cases, Germany's case numbers rose by over 20%. However, the increase varies by length of stay. From 2007 to 2016, cases with stays of one to three days rose by about 43%, cases with stays of four to six days saw a moderate increase of approximately 9%. In contrast, cases with stays exceeding six days decreased by 8%. The rise in case numbers has led to fundamental criticism of the DRG-based payment system. There is ongoing debate about the extent to which this increase is due to the system's design versus other factors, such as a higher demand from an aging population, more complex health needs, and medical advancements. There is also disagreement and a lack of evidence on whether the DRG system has improved efficiency through stable resource use as case volumes grow, and if it has impacted care quality, potentially encouraging premature discharges.

There is general agreement that the implementation of both the MLA and FDA control mechanisms helped to curb the growth in case volume. Since the introduction of the control mechanisms, the increase in hospital expenditures has been influenced more by price effects than by volume.

Budget expansions and adjustments to DRG base rates – often driven by negotiated agreements and inflation adjustments – contributed significantly to expenditure increases.

Challenges in the provision of healthcare services due to hard volume cap and outdated tariffs in Lombardy

The introduction of DRG-based payments had a positive impact on the LOS and the gradual shift of less complex cases from an inpatient to a day case or outpatient setting, which is in line with the goals of optimising resource allocation and improving efficiency. However, the system is also criticised, mainly because of two factors: 1) the differing administrative and institutional capabilities of regions in implementing a fully activity-based approach, and 2) a significant misalignment between the goals of national and regional tariffs. National tariffs have not been updated since 2012, considerably reducing the capacity of DRGs to be a flexible tool for the regions. The DRG classification system is not up to date to adequately describe the healthcare situation, both from a clinical and an economic/financial point of view.

The hard volume cap for hospital care offers the advantage of maintaining control over the overall budget at the macro level. However, setting a fixed budget also leads to problems in the provision of healthcare services: a small increase in high-reimbursement procedures may have a significant impact on the allocated budget, and lead to a reduction in many low-reimbursement procedures and/or waiting lists.

Hard volume caps in Hungary significantly decreased hospital activity, but hospitals were impacted differently

Since 2004, hospital volume in Hungary is constrained by the so-called Performance Volume Limit (PVL). The PVL is an upper volume cap per hospital, accompanied by degressive tariffs for the activity above the limit. The volume-dependent tariffs were changed several times between 2004 and 2013, but in the period 2006-2010, they were set to zero: hospitals were not reimbursed at all for the activity performed beyond the PVL. No clear method was used to define the characteristics of the PVL.



The PVL had a significant impact on hospital admissions and overall hospital activity. Between 2003 and 2006, the growth of hospital activity stopped, but the annual number of inpatient cases continued to increase, while the average length of stay decreased, indicating a more efficient use of hospital resources. It was argued that, in the degressive price zone, hospitals admit patients with very low variable costs for whom most of fixed hospital costs were covered.

A notable decline in both the number of cases and the average length of stay was observed only between 2007 and 2008, indicating that the PVL effectively limited hospital activity. It is estimated that the PVL, by setting an upper limit on the annual activity of hospitals, led to a reduction in the national volume, resulting in health insurance budget savings ranging from 1.9% to 5.6% annually during the period from 2004 to 2008.

However, as the number of admissions decreased, long waiting lists developed. Also, patient referrals shifted from lower-level hospitals to university hospitals and national centres. These high-level hospitals were unable to refer patients to other facilities, leading their activity to exceed the PVL without receiving reimbursement.

3.6 Hospital payment reforms in selected countries

Since the 1990s, DRG-based payments per case have gradually become the principal way of reimbursing hospitals, mainly for acute inpatient care in most OECD countries.¹ They gradually replaced FFS payments and global budgets which were the most popular payment systems before the introduction of DRGs. DRG-based hospital payment systems have the potential to enhance efficiency (for example, the length of stay) in the delivery of hospital services: they are paid according to the number of cases they treat and because the prices they face are set independently of their costs, hospitals are also incentivised to control costs. Unintended consequences may include quality reduction, cost-shifting, patient selection, or up-coding to higher-priced DRGs.

Policymakers have attempted to offset the negative side effects of DRG payment systems by introducing additional policies, though with varying degrees of success. More recently, countries started exploring more comprehensive reforms in hospital payment methods to better align payment system incentives with the shift towards value-based care. In Milstein and Schreyögg (2024)¹, four reform trends are highlighted: (1) decreasing the overall proportion of inpatient payments based on DRGs; (2) providing additional payments to rural hospitals or excluding them from the DRG system; (3) implementing episode-based payments that offer a single combined price for all services along a patient's care pathway; and (4) introducing financial incentives to encourage care delivery in less costly settings.

In the sections that follow, we outline payment reforms in the five countries studied that align with the trends mentioned above. For details on additional payment reforms, for instance the introduction of payments for quality (P4Q) or reforms mainly related to chronic or rehabilitation care, please refer to the country reports in the [Supplement](#).



3.6.1 Specific payment systems for rural hospitals

Although the criteria to define rural hospitals differ between countries, rural hospitals generally operate in areas with a low population density and the distance to the nearest provider is considered too great. Rural hospitals either receive add-on payments to the DRG payments or are funded through an entirely different method. The purpose of these payments is to provide financial stability to hospitals in low-population areas where generating enough income through patient volume alone is challenging. These hospitals struggle to cover (fixed) costs under DRG payment systems due to lower patient numbers.

In Estonia, France and Germany special measures were taken for rural hospitals (see section 3.4.2).

In **Estonia**, one general hospital is located on a small island. It needs to offer 24/7 basic care such as emergency care, intensive care, internal medicine, general surgery, etc. Therefore the EHIF's main objective was to ensure access and availability of services 24/7. Since the hospital's fixed costs could not be met through activity-based DRG payments alone, it now operates primarily under a global budget model. A set of indicators to monitor performance (hospital service use, efficiency and outcomes) were introduced.

Community hospitals (*hôpitaux de proximité*) in **France** are located in sparsely populated areas and play a critical role in ensuring access to healthcare. However, activity-based payments alone are insufficient to sustain these hospitals financially, so they receive additional funding to support their operations (since 2015). This extra funding helps maintain essential services in rural areas where patient volumes are too low to cover fixed costs through standard payment models. The funding was an annual fixed add-on payment to DRG payments. However, since 2021, community hospitals are funded independently of the number of cases treated. The add-on payments have been replaced by prospective global budgets, adjusted by quality (coordination), with a three-year financial guarantee.

In **Germany**, a distinction is made between small hospitals that are crucial for regional basic care and rural hospitals. While both types are not excluded from DRG-based payments, small hospitals receive an add-on payment per case on top of DRG-based payments (*Sicherstellungszuschläge*). The aim is to maintain access to essential services (like emergency care, obstetrics or paediatrics) in underserved areas, ensuring that hospitals with low patient volumes remain financially viable and able to provide critical care. For a hospital to be considered indispensable, its closure should result in residents having to travel over a certain distance to reach the nearest suitable hospital (for example, for obstetrics and gynaecology there is a 40-minute threshold). This ensures that essential health services remain accessible to rural populations without the need for long-distance travel. Hospitals receiving the add-ons, must meet certain quality criteria (11 indicators were defined).

Hospitals in rural areas receive an annual flat-rate subsidy (*Pauschale Zuschläge für bedarfsnotwendige Krankenhäuser im ländlichen Raum*) regardless of financial deficits. The minimum amount of € 400 000 increases with the number of essential departments.

These supplemental payments in the three countries support healthcare access in rural areas by recognising that the DRG system alone does not provide adequate funding for hospitals with lower patient volumes but essential public health roles.

3.6.2 Reduction of share of DRG payments

In the review of Milstein and Schreyögg, six out of ten countries are shifting from using DRGs as the primary hospital payment method toward a mix of DRGs and global budgets. Under this model, DRGs may help set the budget but are not the direct payment method. These countries vary in their reliance on DRG-based payments and in their plans to decrease DRG usage. Also some of the countries studied in this report, reduced the share of DRG payments in hospital funding.



Costs of nursing care excluded from DRG tariffs in Germany

In **Germany**, the costs of nursing care were separated from the DRG tariff as part of the Hospital Structure Reform (*Krankenhausstrukturgesetz*), which came into effect on 1 January 2020. The main purpose of separating the nursing staff budget (*Pflegebudget*) from the DRG-based payments was to better reflect the specific needs and resource demands of nursing care, which were previously bundled into the DRG system, where they were not appropriately accounted for. The costs of nursing services, which include wages, staff training, and other related expenses, have been rising steadily. These costs were becoming a significant burden for hospitals, but they were not adequately captured within the DRG system, which primarily focuses on inpatient medical treatments. This led to financial strain on hospitals that were expected to manage both medical and nursing care within the same DRG-based payment structure, which often failed to cover the full extent of nursing expenses. By decoupling nursing costs from the DRG payments, the reform aimed to create a more transparent and fairer system of reimbursement for nursing care, which has different cost structures compared to medical treatments. Since then, nursing costs have been allocated through a dedicated budget (*Pflegebudget*) which is allocated directly to hospitals to cover the wages and other expenses associated with nursing staff. The nursing staff budget is calculated according to the principle of cost coverage. It will be included in the retention payment system (*Vorhaltevergütung*) (see next paragraph).

A shift towards global budgets in Germany

The Hospital Care Improvement Act (*Krankenhausversorgungsverbesserungsgesetz*, KHVVG) will significantly reform hospital care in Germany. The country is shifting from a DRG-dominated hospital payment system (share of about 80%) to a model that combines DRG payments with a fixed retention payment (*Vorhaltevergütung*) to alleviate economic pressure on hospitals caused by inadequate state investment funding. Although DRG payments are intended solely to cover operational costs, hospitals are forced to use these funds to make up for insufficient investment funding from the states. The volume-oriented DRG system has incentivised hospitals to prioritise profitable

treatments, often at the expense of necessary but less profitable services. The fixed payment is independent of patient volume and covers 60% of the revenue that would previously have been generated through DRG payments at the hospital level, based on an estimation of fixed costs in the hospital setting from 2016. The reform aims to stabilise hospital finances by supporting essential services. Additionally, by including the nursing budget within the retention payment, Germany further separates essential operational costs from DRG-dependent revenue. The goal is to shift hospitals toward a more sustainable financial model that balances fixed and activity-based funding while encouraging quality and essential service provision over volume. Simultaneously, the revenue shortfall compensation (*Mindererlösausgleich*, see section 3.5.2), which was intended to cover fixed costs in the event of lower case volumes, will be eliminated. To continue counteracting any incentives for increased service provision, the regulations for revenue surplus compensation (*Mehrerlösausgleich*) will remain unchanged.

Insufficient investment funding has resulted in an increasing number of hospital closures. Therefore, the reform in the Hospital Care Improvement Act also aims to align hospital restructuring with actual care needs by expanding and standardising hospital planning through 'care delivery groups' (*Leistungsgruppen*, LGs). The 65 initial LGs cover all treatments and define nationwide quality standards, including requirements for related service provision, equipment, staffing, and other structural and process criteria, which can be met individually or through collaborative care networks. Hospitals will only be allocated the global budget associated with the care delivery groups (e.g. cardiology) that have been assigned to them in the planning process. To ensure nationwide coverage, exceptions are planned for essential rural hospitals, with further increased surcharges (see section 3.6.1).

The Hospital Care Improvement Act was approved by the Bundestag, the lower house of parliament, on 17 October 2024, and also got approval from the Bundesrat, the upper house of parliament, on 22 November 2024.



A new mixed financing system in France

In 2018, French authorities expressed their intention to partially move away from activity-based financing. The objective was to reduce the share of hospital revenue derived from DRG payments to 50%, with the remainder being financed through a combination of payments for quality, bundled payments and global budgets. However, in order to maintain the advantages of the activity-based system (transparency, objectivity and incentives for efficiency), it was decided that a significant share of activity-based financing should remain in place.

The new financing system will start in January 2025. First, standard hospital activities (e.g. standardised surgical or medical procedures) will continue to be financed based on activity. Second, global budgets, negotiated at the regional level, will be allocated to hospitals for activities aligned with public health objectives, such as care for the elderly, women and children, addiction treatment and chronic pain management. This component will also fund prevention, quality initiatives, and care coordination. Third, specific activities (e.g. teaching, research, innovation, referral and expertise services, as well as emergency departments, critical care and care in isolated areas or for chronic diseases) will be financed through a mix of activity-based payments and global budgets. This approach helps fund activities whose costs are largely independent of the volume of activity, ensuring access to care for these activities nationwide.

The French Court of Audit warned that the reduction of the share of DRG payments must be accompanied by other mechanisms to regulate the national budget (ONDAM), that is currently managed through tariff reductions within the activity-based financing system. It has also recommended to strengthen hospital analytical accounting systems to preserve the benefits of the medico-economic coding, even if it becomes less directly tied to payment.

3.6.3 Broadening the scope of a case

The scope of DRG-based hospital payments refers to the services and/or costs included in the DRG payment per case. However, a 'case' is not defined in the same way across systems. In Estonia, France, Germany and Hungary, a case is primarily defined as an inpatient stay at the hospital. The case ends when the patient is discharged. Pre- and post-hospital care (like post-acute care or outpatient procedures) are typically not included in the DRG payment. In Italy, consultations during hospitalisation and medical examinations conducted within 30 days before and/or after hospitalisation are included in the DRG tariffs. Pre- or post-hospitalisation services must be closely linked to the planned or actual hospitalisation and must be provided by the same inpatient facility.

Countries are increasingly implementing episode-based or bundled payment programmes to encourage collaboration between the inpatient sector and other healthcare sectors, aiming to streamline care delivery throughout a patient's care pathway. The conditions covered as well as the definition of an episode vary across programmes. The implementation of episode-based programmes remains relatively limited.

In 2021, the **Estonian** Health Insurance Fund launched a pilot project for ischemic stroke care, aiming to create a comprehensive treatment pathway from ambulance to rehabilitation, reimbursed through bundled payments. The bundled payment includes costs for hospital services, outpatient visits, rehabilitation, nursing care, and complications, covering up to 365 days from the initial emergency admission. Primary healthcare and social services were added to the bundle in 2023. The pilot also incorporated health outcome measurements. Providers can retain savings from the difference between the bundled payment and actual expenses but bear the risk of higher costs, except for cases over € 100 000.

Since 2019, **France** has been testing various payment models to integrate care across different settings. One of these is the episode-based payment programme (*paiement à l'épisode de soins*, EDS), which bundles payments for three conditions: total hip replacement, total knee replacement, and cancer colectomy. The goal is to improve care coordination and efficiency by integrating pre- and post-acute care into the DRG payment model. These



conditions were selected based on high volumes in both private and public hospitals, as well as the importance of post-acute care and rehabilitation. The episode payment covers all services provided, including consultations, rehabilitation, home nursing, and allied health visits, for 45 days before and up to three months after surgery for hip replacement and colectomy, and up to six months for knee replacement. The payment amount is adjusted for factors such as age, co-morbidities, and socioeconomic status, and payments must be distributed among the involved providers, with the hospital usually bearing the financial risk of losses. Quality adjustments are also made, with providers receiving penalties or bonuses based on process and outcome indicators. In 2023, 46 hospitals were involved in the programme, though evaluation results are still pending.

In **Hungary**, a pilot programme was launched to evaluate bundled payment for patients with Chronic Obstructive Pulmonary Disease (COPD). The bundled payment consolidates costs for outpatient specialist visits, hospital services, and other healthcare providers into one average payment. The pilot ran from November 2021 to December 2023, involving 2 000 COPD patients in four counties. Outcomes included reduced hospitalisation rates and readmissions. Also for tuberculosis (TB), a bundled payment system was introduced, covering the costs for the diagnosis, treatment, and follow-up care of TB patients.

Two additional measures in Hungary are related to defining a case but do not involve another care setting than the hospital. If a patient is readmitted, the case is considered as part of the original admission, meaning the readmission is not reimbursed separately. Both admissions are treated as a single case under one payment (the H-DRG tariff). Second, if chronic inpatient care follows acute care in the same hospital within the standard LOS set for acute cases under H-DRG, no separate payment is made for the chronic care. In all other instances, however, reimbursement for chronic inpatient care operates independently from the acute H-DRG system.

3.6.4 *A shift from inpatient to day care and outpatient settings*

In the review of Milstein and Schreyögg, five out of ten countries have introduced financial incentives to move inpatient care to day care and outpatient settings in order to reduce costs, improve efficiency, and decrease waiting times. Also the countries examined in this report have implemented measures to incentivise the transition of care from inpatient settings to more affordable alternatives.

France introduced DRG-based payment reforms to encourage ambulatory surgery by setting equal tariffs for procedures performed as day cases or inpatient stays. This approach was gradually expanded to include more procedures and supported by additional policies, like removing LOS thresholds for low-severity surgeries and requiring hospitals with low outpatient rates to justify inpatient admissions. These reforms increased ambulatory surgeries from 23.5% of all hospital stays in 2014 to 28% in 2021, especially for eye, orthopaedic, and digestive surgeries. Despite these gains, ambulatory surgery rates in France remain lower than in some OECD countries, with significant regional variations and faster growth in the private sector, which primarily handles elective surgeries.

To shift **Germany's** relatively high hospital resources to outpatient care, cross-sector care facilities (also known as level 1i facilities) will be introduced. These facilities, which can offer both outpatient and inpatient services with an emphasis on outpatient care, are primarily formed from former hospitals and are intended to provide the following services: outpatient treatment, outpatient surgery, essential and voluntary inpatient services (to be defined by 2025), etc. The long-term goal is to establish cross-sectoral reimbursement for these facilities. However, initially, full and partial inpatient services, including same-day cases, as well as nursing care, will be reimbursed based on declining hospital-specific daily rates. Outpatient services will follow the standard outpatient reimbursement scheme.

Previous reforms aimed at reducing inpatient cases and promoting cross-sector care include the introduction of same-day hospital reimbursements (*Tagesstationäre Fälle*) in 2022 and the implementation of hybrid DRGs in 2023. Under the same-day treatment mechanism, hospitals can provide



treatment without an overnight stay, as long as there is a medical indication and the patient agrees. Day cases are reimbursed like regular inpatient cases, but with an average deduction of around € 160 (2023) per saved night, not exceeding 30% of the total reimbursement.

Hybrid DRGs apply to specific services regardless of whether they are provided outpatient or inpatient. This system currently covers 10 treatment areas and is expected to expand. Hybrid DRGs are selected based on criteria such as high case volume, short length of stay, and low clinical complexity.

Hungary has implemented several measures to promote one-day surgery activities. Notably, the number of procedures eligible for one-day surgery has significantly increased from 408 in 2010 to 781 in 2019. This shift was driven by financial incentives. In 2015, the Performance Volume Limit (PVL), which previously capped the number of cases, was removed for one-day surgeries, allowing hospitals to perform an unlimited number of these procedures without a reduction in tariffs. Since 2017, hospitals have received an additional 10% DRG tariff for cases treated as one-day surgeries instead of inpatient care. While only 20% of surgical cases were performed as day cases in 2010, this proportion grew to 45% by 2019. Additionally, the percentage of eligible cases treated as day cases increased from 42% in 2010 to 80% in 2019.

Similarly, anti-tumour treatments, such as chemotherapy, are often provided in hospitals without overnight stays. These treatments are part of the H-DRG system, with the same tariff applied whether they are delivered in a hospital or outpatient unit.

4 IMPACT OF DRG-BASED PROSPECTIVE PAYMENT SYSTEMS: UMBRELLA REVIEW

Key points

- This umbrella review identified nine systematic reviews that explored the impact of Diagnosis Related Group (DRG)-based prospective payment systems (PPS) on healthcare efficiency, quality of care, and costs. Six of the reviews analysed mixed patient populations, while three focused on specific conditions: appendectomy, cholecystectomy, and stroke. Most of the included reviews drew upon relatively recent primary studies (2018 or later), and, except for one, were of moderate to high methodological quality. The studies included in the reviews are often limited by the heterogeneity of the included payment programmes, contexts, and accompanying interventions, making it challenging to attribute observed impacts directly to DRG mechanisms; further limitations include reliance on before-after studies without control groups, contextual biases related to the US, variability in study periods, limited meta-analyses, and potential publication bias.
- Efficiency: The vast majority of reviews concluded that the implementation of DRG-based payment systems leads to a reduction in hospital length of stay. This finding supports the theoretical assumption that DRG payment structures incentivise greater efficiency in healthcare delivery.
- Quality of care: While theoretical concerns exist that efficiency gains may come at the expense of quality, this review did not find substantial evidence to support these concerns.
 - Mortality: No increase in mortality rates was associated with the introduction of DRG-based payment systems.



- Readmission rates: Evidence on readmissions is mixed. Some meta-analyses reported a reduction in readmission rates, while one meta-analysis indicated a potential trade-off, with efficiency gains in inpatient care potentially linked to higher readmission rates in specific procedures (e.g. cholecystectomy). It should be noted that readmission rates are also influenced by external factors such as the quality and availability of post-acute services.
- Other quality measures: Mixed results or no negative impact was observed on other quality-of-care indicators, including complications.
- Costs and service utilisation:
 - The effect of DRG-based payment systems on healthcare costs was less consistently reported across the reviews, and findings were inconclusive.
 - There was no clear evidence of a shift in service delivery from inpatient to outpatient care. While no significant changes were noted in outpatient visits or emergency department use, one meta-analysis highlighted a notable increase in the proportion of patients discharged to post-acute care facilities (e.g. nursing homes, skilled nursing facilities, rehabilitation centres). This trend was particularly pronounced in studies from the United States.
 - Volume of services: While DRG-based payment systems theoretically create an incentive for hospitals to increase admissions in order to boost revenue, the evidence on this point is mixed. This suggests that the volume incentive may be counterbalanced by control mechanisms such as volume and tariff caps, although these factors were not addressed in detail in the included reviews.

4.1 Introduction

Prospective payment systems (PPS) are a reimbursement method in which healthcare providers receive a predetermined payment for services provided to patients. This payment method aims to control healthcare costs and incentivise efficiency in service delivery. However, the impact of PPS on the quality of patient care and healthcare efficiency remains contentious. To provide a comprehensive overview and inform policy makers, this study conducts a systematic review of reviews, about the effects of introducing PPS.

4.2 Methods

4.2.1 Research question

The primary objective of this umbrella review is to synthesise existing systematic reviews on the impact of PPS on the quality of patient care, healthcare efficiency and hospital costs in an attempt to answer the following research question:

- What is the impact of PPS as a payment mechanism for inpatient care on the quality of patient care and healthcare efficiency and costs, as evidenced by existing systematic reviews?

4.2.2 Literature search and selection

Search strategy

A search for published systematic reviews (i.e. systematic reviews (SR) - with or without meta-analysis (MA) - including primary studies with following designs: pre/post design; interrupted time series; experimental studies; cohort designs) from 2014 to September 2024 was conducted among the following electronic databases: MEDLINE and EconLit. Furthermore, reference lists of studies included in reviews were also screened after the first round of sifting (based on title and abstract) to identify additional studies. The complete search strategies are provided in Appendix 1.



The PICO framework in Table 6 is used to offer a transparent view on inclusion and exclusion criteria:

- P: population (humans admitted in acute, general or academic hospitals as inpatient). Reviews focusing on the specific procedures or medical conditions are identified and a decision to include them will be made after the identification of the number of general systematic reviews. If this number is below 10, pathology-specific reviews are added to the study selection. Reviews focusing on specific geographical regions or on low- and middle income countries were excluded. Nevertheless, from the selected reviews, primary studies were included independently of location.
- I: intervention (any prospective payment system intervention – DRG-payment system). A PPS is a payment system where payment rates are determined ex ante and there is no link with the individual costs of a provider or case. These systems often rely on DRGs (Diagnosis Related Groups) as classification system. Other similar patient classification systems are for instance DBC (*Diagnose Behandelcombinatie*), HRGs (Hospital Resource Groups), etc. DRGs are assumed to be homogeneous clinically and in terms of resource utilisation. These groups are then assigned predetermined reimbursement rates per case. Such a system creates strong incentives to increase admissions and shorten length of stay, as the marginal revenue in case-based payment systems becomes zero after the first day of treatment. The terminology used is diverse: activity-based payment; prospective payment; DRG-based payment; case-based payment, payment per condition, etc.
- C: comparison (other payment systems). Examples of alternative payment systems are retrospective payment; cost-based reimbursement of hospitals; payment per service as the unit of payment.
- O: the outcomes of interest are: quality of healthcare (unscheduled readmissions within 30 days, in-hospital mortality, all-cause mortality, 30-day mortality, etc.), efficiency (e.g. LOS), activity (e.g. number of admissions) and costs. Secondary outcomes are complications, symptom relief, change in discharge destination (e.g. from home to nursing home), patient satisfaction.

Language restrictions were set to English, Dutch, French and German. As study settings, it was chosen to limit to reviews with a focus on studies conducted in the acute inpatient hospital settings and to exclude studies carried out in psychiatric hospitals, nursing homes, skilled nursing facilities, day cases, outpatient care.



Table 6 – In- and exclusion criteria

	Inclusion	Exclusion
Population	Humans	Pathology specific reviews (e.g. cholecystectomy) will be excluded depending on the availability of general reviews Reviews focusing on low- and middle-income countries or on specific geographical regions
Healthcare setting	- General hospitals - Acute hospitals - Academic hospitals	- Nursing homes - Day cases (without inpatient care included in the review) - Outpatient care - Skilled nursing facilities - Psychiatric hospitals
Intervention	Introduction of PPS per case (e.g. DRG)	Other interventions including per diem payment
Comparator	Inpatients treated under alternative systems	
Outcome	Primary: - Length of stay - Mortality - Readmissions - Complications - Activity (Hospital discharges) - Costs Secondary: - Symptom relief - Satisfaction - Discharge destination	
Design	Systematic reviews including primary studies with following designs: before-after design; interrupted time series; experimental studies; cohort designs	Primary studies and narrative reviews, realist reviews, (non-systematic) scoping reviews, integrative reviews, meta-syntheses, systematic reviews published by one author or based on one database, letters to the editor, case reports, conference abstracts, editorial reports, etc.
Time		Systematic reviews published before 2014
Language	Dutch, French, English, German	Other

Table based on Pott et al. (2023)¹⁹



Study selection

After exporting the search results from the consulted databases into one Rayyan folder, duplicates were removed. SRs (with or without MAs) were retained for inclusion. The inclusion process was performed independently in parallel by two reviewers, starting with a review of titles/abstracts. Next, full texts of any relevant or unclear studies identified via our search were inspected by two reviewers independently. Reasons for exclusion of full-texts were documented and categorised according to the predefined in- and exclusion criteria (see Table 6). In case of a different outcome of the sifting (both after the sifting of titles and abstracts and after the full-text inspection) the reviewers consulted each other to determine eligibility or reason for exclusion.

The study selection process is presented in a flowchart (see Figure 1).

4.2.3 Quality appraisal

The quality of any identified relevant SR was assessed based on AMSTAR 2 by two reviewers (first four reviews, the other reviews were done by one reviewer only). In case of doubt, the criteria and scoring were discussed with the second reviewer. The critical appraisals of the primary studies that were performed by the authors of the included reviews were extracted as such as part of our data extraction.

4.2.4 Data extraction and synthesis

Relevant data from the included studies were extracted and tabulated in a data extraction form. A template for pilot testing data extraction (two reviews done by each reviewer) was developed, discussed (within the research team) and refined. Data extraction for the remaining articles was done by one reviewer. Tables were presented for the quality assessment of the included studies, the study characteristics and the study results.

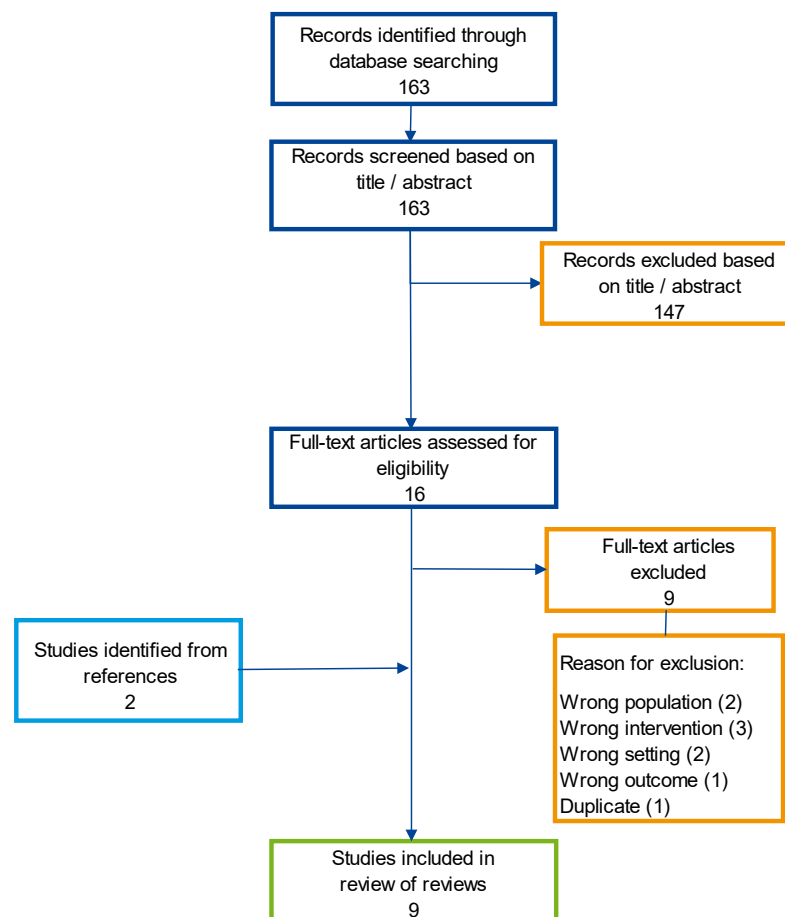
4.3 Results

4.3.1 Literature search and selection

The electronic database search identified 163 potentially relevant references (see Figure 1). Based on title and abstract, 147 references were excluded. Of the remaining 16 references, 7 references were included based on full-text evaluation and 9 references were excluded. Screening of the reference lists identified 2 additional relevant references. In total, 9 systematic reviews were included.



Figure 1 – Study flow of selection



4.3.2 Overview of selected studies

In total, nine systematic reviews were selected. For each of them, details about the number and type of included studies, setting and databases searched are given in Table A.1 in Appendix 1. Six reviews considered mixed populations of hospitalised patients while three reviews focused on specific target groups: one on appendectomy²⁰; one on cholecystectomy²¹ and one on stroke²². However, also in reviews concerning mixed populations of hospitalised patients, many primary studies focused on specific target groups.

The scope of included payment mechanisms was variable. Several reviews^{20, 23-26} focused only on one payment type (i.e. DRG-like based prospective payment). Other reviews^{21, 22, 27} included several payment systems. For the latter, we included only these sections and results that referred to prospective payment systems in hospital settings. One review¹⁹ included several prospective payment systems. Most of the included primary studies in this review (58/64) focused on per-case or per-episode PPS, but three investigated per-diem PPS, two looked at forms of capitation and one analysed the introduction of a global budget. Although the vast majority of included primary studies (58/64) looked at the introduction of a PPS, six of the included primary studies examined a price change within an existing PPS. In addition, while most primary studies (60/64) focused on acute healthcare settings, four of the included studies investigated post-acute care settings. As individual primary studies could not always be isolated in the results of the systematic review, all results were included in the analysis.

The included outcomes also varied between the included reviews, but most of them analysed efficiency (length of stay)^{19-25, 27} and/or quality of care (mortality^{19, 21-24, 26, 27}, readmission rates¹⁹⁻²⁷ and/or complications/severity of illness^{19, 20, 26, 27}). Six reviews analysed costs-related outcomes.^{20-23, 25, 27} Six reviews examined the impact on other settings (outpatient, post-acute and/or emergency department).^{19, 20, 22, 23, 26, 27} Only three reviews^{21, 23, 26} looked at volume or admissions and only one¹⁹ at users' satisfaction.



For all but one review, the last year searched is 2018 or more recent. In one review, included studies date from 1980 to 2012.²⁶ Another review covers a ten-year period from 2012 to 2022.²⁰ The other seven reviews cover an extended period of time (from inception or from 1983 – corresponding to the induction of first DRG-like payment systems – to 2018 or later). Five reviews include the most recent period (2020 or after).^{19-22, 24}

The selected reviews, apart from one, all include studies from the US. In Lino et al. (2023)'s review about appendectomy patients, only studies from Korea and China are included, although no exclusion criteria were defined based on geography.²⁰ The number of represented countries also varies between reviews (from 1 to 13 different countries in the included primary studies).

4.3.3 *Quality appraisal*

In Table 7, the number of met AMSTAR 2-criteria per included systematic review is shown as well as the score per criterion. The number of criteria met varied from 4 to 15. The included reviews, apart from one (Argarwal et al., 2020)²⁷ can be considered as moderately or well-performed systematic reviews.



Table 7 – AMSTAR 2 evaluation of systematic reviews on impact DRG payment on quality, efficiency and cost

	Argarwal et al. (2020)	Barouni et al. (2021)	Brown et al. (2022)	Chen et al. (2023)	Lino et al. (2023)	Meng et al. (2020)	Palmer et al. (2014)	Pott et al. (2023)	Zhao et al. (2024)
1. Research question and inclusion criteria include components of PICO	No	No	Yes	Yes	Yes	Yes	Yes	Yes	Yes
2. Explicit statement on protocol prior to conduct of review	No	No	Yes	Yes	Yes	Yes	Yes	No	Yes
3. Explain selection study design (RCT and/or observational)	No	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
4. Comprehensive literature search strategy	Partial yes	Partial yes	Partial yes	Partial yes	Partial yes	Partial yes	Yes	Partial yes	Partial yes
5. Study selection in duplicate	No	Yes	No	Yes	Yes	Yes	Yes	Yes	Yes
6. Data extraction in duplicate	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
7. List of excluded studies	No	No	No	No	No	Partial yes	No	No	No
8. Details included studies	Yes	Partial yes	Partial yes	Yes	Yes	Yes	Yes	Yes	Yes
9. Satisfactory technique to assess Risk of Bias included studies	No	Yes	Partial yes	Yes	Yes	Yes	No	Yes	Yes
10. Source of funding included studies	No	Yes	No	No	No	No	No	Yes	No
11. Appropriate methods for statistical combination of results (meta-analysis)	NA	NA	NA	Yes	Yes	Yes	Yes	NA	Yes
12. Assess potential impact of risk of bias individual studies on the results of meta-analysis	NA	NA	NA	No	No	Yes	No	NA	Yes
13. Account for risk of bias individual studies when interpreting/discussing results of the review	No	No	No	No	No	Yes	No	Yes	Yes
14. Satisfactory explanation for heterogeneity observed	No	No	No	No	No	Yes	Yes	No	No
15. Adequate investigation of publication bias	No	No	No	No	No	Yes	Yes	No	Yes
16. Report potential sources of conflict of interest including funding	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Number of items with yes or partial yes	4	7	8	10	10	15	11	10	12



4.3.4 Effect on outcomes

4.3.4.1 Overview

In Table 8, an overview is provided of the results of the selected systematic reviews. More details are provided in Table 9.

Table 8 – Overview of results of systematic reviews

	Argarwal et al. (2020) ²⁷	Barouni et al. (2021) ²³	Brown et al. (2022) ²²	Chen et al. (2023) ²⁴	Lino et al. (2023) ²⁰	Meng et al. (2020) ²⁵	Palmer et al. (2014) ²⁶	Pott et al. (2023) ¹⁹	Zhao et al. (2024) ²¹
Number of studies	2**	21	4**	29	6	18	65	64	4**
Period	- to 2019	1983 to 2018	- to 2020	- to 2022	2012 to 2022	- to 2018	1980 to 2012	1983 to 2020	- to 2023
Length of stay	↓	(↓)	=	↓	↓	↓		(↓)	=
Mortality	=	(↓)	(↓)	=			↓↑	↓↑	=
Readmissions	(↓)	↓↑	↓	=	↑	↑	↓↑	↓↑	↑
Other quality of care outcomes*	=				=		↓↑	↓↑	
Costs or spending	=	↓↑	↑		=	↓			↓↑
Post-acute care utilisation	↓		↑				↓↑		
ED or outpatients visits	=	(↓)			=			=	
Cost shifting		(↑)							
Admissions or volume		↓↑					↓↑		(↑)
Users' satisfaction								(↓)	

* Complications, severity of illness and condition at discharge; ** only studies selected for the analysis; ↓ = significant decrease in pooled meta-analyses or decrease in all considered non-pooled studies; (↓) = decrease in some non-pooled studies with non-significant change in other non-pooled studies; = = non-significant impact in pooled meta-analyses or no change in all considered non-pooled studies; ↓↑ = mixed results; ↑ = significant increase in pooled meta-analyses or increase in all considered non-pooled studies; (↑) = increase in some non-pooled studies with non-significant change in other non-pooled studies.



Table 9 – Characteristics and results of systematic reviews

Reference	Population	Intervention and comparator	Outcome of interest	Included studies in meta-analysis/SR	Impact	Remarks	Author conclusions
Agarwal et al. (2020) ²⁷ [restricted]	Medicare patients who underwent a cardiac or orthopaedic surgical procedure included in the ACE demonstration	ACE versus FFS	Length of stay	1 pre/post study (n=3 942)	Significant decrease in the mean LOS		<i>Not applicable</i>
			Mortality <i>Within 30 days</i>	1 CBA study (n=67 408)	ACE not associated with differences in mortality		
			Readmission <i>All causes, within 30 days</i>	2 non-pooled studies: 1 CBA and 1 pre/post (n=71 350)	In 1 study, significant reduction in readmission rates with ACE for orthopaedic surgery but not for cardiac surgery; in 1 study NS impact		
			Complications <i>Within 30 days</i>	1 CBA study (n=67 408)	ACE not associated with differences in complication rates		
			Episode payments	2 non-pooled studies: 1 CBA and 1 pre-post (n=71 350)	NS effect on episode payments	In 1 study, a NS increase in episode payments for cardiac surgery and a NS decrease for orthopaedic surgery	
			Spending for inpatient hospitalisation	2 non-pooled studies: 1 CBA and 1 pre-post (n=71 350)	NS difference in 1 study; no test for significance in 1 study		
			Spending in post-acute care period	1 CBA study (n=67 408)	Significant reduction in spending		
			Emergency department visits <i>Within 30 days</i>	1 pre/post study (n=3 942)	ACE not associated with differences in emergency department visits		
Barouni et al. (2021) ²³	Hospitalised patients	DRG-based payment implementation	Length of stay	18 non-pooled studies: 1 RCT, 5 cohort, 12 pre/post	15 studies with reduced LOS, 3 studies (2 cohort and 1 pre/post) with no change		<i>"The reimbursement system based on DRGs has different outcomes in different types of</i>



Reference	Population	Intervention and comparator	Outcome of interest	Included studies in meta-analysis/SR	Impact	Remarks	Author conclusions
			Mortality	14 non-pooled studies (1 RCT; 4 cohort; 9 pre/post)	4 studies (2 cohort and 2 pre-post) with reduced mortality and 10 studies with NS results		<i>health care systems. On the one hand, it reduces the average hospital stay and reduces health costs; on the other hand, due to limiting the services and providing inadequate services, it may have a negative effect on the quality of care and capacity utilization."</i>
			Readmission	12 non-pooled studies (3 cohort, 9 pre/post)	5 studies NS result; 4 pre-post studies with reduced readmission rates; 3 pre-post with increased readmission rates		
			Costs	7 non-pooled studies: 1 cohort and 6 pre/post	Mixed results: 4 with reduced and 3 with increased costs		
			Cost shifting to other centres	7 non-pooled studies: 3 cohort and 4 pre/post	5 studies showed cost shifting, 2 studies showed that referral rates of patients with high expense did not change		
			Patient consultations	2 cohort studies	Constant results (before-after DRG implementation) for patient consultations		
			Emergency department use	3 pre/post studies	2 studies showed a decrease and 1 no change in ED use		
			Capacity utilisation and other healthcare use	3 studies on ICU (2 cohort, 1 pre/post) / CCU use; 4 pre/post studies on medication prescription/administration; 2 pre/post studies on surgery rates; 1 cohort study on use of lab tests and imaging; 2 pre/post studies on use of hospital services;	Mixed results for ICU; 2 studies with no change in medication use, 2 with a reduction after implementation; Reduced surgery rates in all 3 studies; Reduction in use laboratory and imaging tests; 2 studies with reduced hospital services;		



Reference	Population	Intervention and comparator	Outcome of interest	Included studies in meta-analysis/SR	Impact	Remarks	Author conclusions
				1 pre/post study on number of physician and nurses	The number of nurses was decreased, the number of physicians increased		
			Admission or hospitalisation rates	7 non-pooled studies: 3 cohort and 4 pre/post	Mixed results: reduced (3 studies) and increased (3 studies) admission rates, 1 study with decreased rates for <70 years – increased rates for 70 years or older		
Brown et al. (2022)²² [restricted]	Haemorrhagic or ischemic stroke; TIA plus stroke	DRG-based PPS versus FFS	Length of stay	1 CBA study	No change in acute LOS		<i>Not applicable</i>
			Mortality <i>30-day stroke mortality</i>	2 non-pooled cross-section studies	1 study showed reduced mortality, 1 study showed no effects on mortality		
			Readmission <i>Within 30 days</i>	2 non-pooled cross-section studies	Reduced readmission rates in both studies		
			Total inpatient rehabilitation spending	1 pre/post study	Increase in total inpatient rehabilitation spending		
			Post-acute care utilisation	2 non-pooled studies: 1 CBA and 1 pre/post	In 1 study, increased likelihood of discharge to post-acute care; in 1 study increase in post-acute LOS from pre-intervention to base year, then decreased slightly from base-year to post-intervention years (overall increase)		
Chen et al. (2023)²⁴	Inpatients of all gender, age, disease groups	DRG-based versus cost-based payment	Length of stay	12 pooled cohort studies (n=2 753 305)	SMD=-0.25 (95%CI: -0.38 to -0.11); p<0.01; I ² =99.7%	Association DRG and LOS in implementation group <2 years but not for ≥2 years. No difference in age-sub	<i>"The results of this meta-analysis indicated that Diagnosis related group (DRG) based payment has a positive</i>



Reference	Population	Intervention and comparator	Outcome of interest	Included studies in meta-analysis/SR	Impact	Remarks	Author conclusions
				5 pooled CBA studies (n=80 493)	SMD=-0.19 (95%CI: -0.72 to 0.33); p=0.474; I ² =99.8%	groups; Sign. association for appendectomy subgroup but not for pneumonia, heart failure, COPD	<i>effect on length of stay but no effect on inpatient mortality and readmission rates. Current knowledge on the effects of DRG payment on quality of medical care is primarily based on studies in patients with mixed diagnoses. Furthermore, owing to limitations in the quantity and quality of the included studies, future studies with larger sample size and well-controlled confounding factors are required to confirm the presented findings."</i>
				17 pooled studies – overall results (cohort + CBA) (n=2 833 798)	SMD=-0.25 (95%CI: -0.37 to -0.12); p<0.01; I ² =99.7%		
				5 pooled pre/post studies (n=32 933 862)	RDC= -10.76 (95%CI: -18.54 to -2.98); p=0.007		
			Mortality <i>In-hospital mortality</i>	3 pooled cohort studies (n=2 427 138)	RR 0.91 (95%CI: 0.72 to 1.15); p=0.4117; I ² =14.6%		
			Readmission <i>within 30 days</i>	7 pooled cohort studies (n=2 750 556)	RR 0.79 (95%CI: 0.62 to 1.01); p=0.058; I ² =96.1%	No significant increase for subgroup analyses diagnostic groups (pneumonia, heart failure, COPD); age, length of DRG implementation	
Lino et al. (2023) ²⁰	Patients submitted to appendectomy	DRG model versus FFS model	Length of stay	5 pooled cohort studies (n=281 346)	SMD=0.39 (95%CI: 0.38 to 0.40); z=76.60; p<0.00001; I ² =0%		<i>"This systematic review assessed the fixed remuneration model's effectiveness for appendectomy compared to the traditional pay-per-service model. Through a review of the medical literature, only appendectomy data was included. Our meta-analysis revealed no significant</i>
			Readmission	4 pooled cohort studies (n=281 685)	OR=1.57 (95%CI: 1.02 to 2.44); z=2.04; p=0.04; I ² =90%		
			Complication	4 pooled cohort studies (n=1 683)	OR=1.38 (95%CI: 0.92 to 2.06); z=1.55; p=0.12; I ² =0%		
			Costs <i>Associated with appendectomy</i>	3 pooled cohort studies (n=281 078)	SMD=6.70 (95%CI: -5.34 to 18.74); z=1.09; p=0.28; I ² =100%		



Reference	Population	Intervention and comparator	Outcome of interest	Included studies in meta-analysis/SR	Impact	Remarks	Author conclusions
			Outpatient visits	2 pooled cohort studies (n=1 016)	SMD=-0.88 (95%CI: -2.85 to 1.09); z=0.88; p=0.38; I ² =97%		differences in final costs, complication rates, and post-surgery outpatient visits. However, the fixed payment model had a shorter hospital stay, but at a cost of a higher hospital readmission rate."
Meng et al. (2020) ²⁵	Hospitalised patients	DRG-based versus cost-based payment	Length of stay	5 pooled pre/post studies (n=32 933 862)*	RDC=-10.76 (95%CI: -18.54 to -2.98); z=2.71; p=0.007; I ² =81.9%	No subsequent effect on LOS change over time.	"Although it is difficult to draw unequivocal conclusions about the links between DRGs-based payment systems and inpatient health utilization from our review, the findings suggested that DRGs-based payment had potential cost-saving implications by lowering LOS, but was associated with higher readmission rates .Policy-makers considering adopting DRGs-based payment should pay more attention to monitoring the hospital readmission rates, compared with cost-based payment."
				8 pooled CBA studies in meta-analysis (n=407 532)* [13 studies (n=613 442)* in SR]	RDC=-5.92 (95%CI: -13.66 to 1.81); z=1.50; p=0.134; I ² =92.9%		
				13 pooled studies – overall results (pre/post + CBA) (n=33 341 394)*	RDC=-8.07 (95%CI: -13.05 to -3.10); z=3.18; p=0.001; I ² =91.4%		
			Readmission within 14, 30 or 90 days	2 pooled pre/post studies (n=51 365 090)	RDC=3.43 (95%CI: -0.63 to 7.49); z=1.65; p=0.098; I ² =0.0%	No subsequent effect on readmission rates change over time.	
				3 pooled CBA studies in meta-analysis (n=332 367) [5 studies (n=378 382)* in SR]	RDC=1.25 (95%CI: 0.32 to 2.18); z=2.63; p=0.009; I ² =0.0%		
				5 pooled studies – overall results (pre/post + CBA) (n=51 697 457)	RDC=1.36 (95%CI: 0.45 to 2.27); z=2.93; p=0.003; I ² =0.0%		



Reference	Population	Intervention and comparator	Outcome of interest	Included studies in meta-analysis/SR	Impact	Remarks	Author conclusions
			Total inpatient spending per admission <i>Only direct hospital costs</i> <i>Excluding significant costs of new treatment</i>	7 non-pooled studies (6 CBA and 1 pre/post) (n=513 805)* DID analysis in 3 of the CBA studies (n=307 128)	DID analysis in 3 CBA : lower inpatient spending associated with DRG-payment in 2 studies; no significant effect in 1 study. ITS analysis in pre/post study: non-significant result	One study calculates the costs from the hospital point of view, the others from individual patient point of view. No meta-analysis because of lack of quantitative data and variation in costs calculation methods.	
Palmer et al. (2014)²⁶	Patients in acute care settings (hospitals and non-hospital medical or surgical facilities)	Activity-based funding versus alternative funding system	Acute care mortality <i>Within time period after admission or surgery (7 days, 30 days, 180 days, 6 weeks, 6 months, 1 year)</i>	8 pooled studies: 7 pre/post and 1 cohort study (n=63 656)	OR=1.03 (95%CI: 0.93 to 1.15); p=0.54; I ² =57%	I ² relatively large but results of the large studies very consistent in showing no difference in acute care mortality. None of the pre-specified sub-group analyses explained heterogeneity in findings.	<i>"Inferences regarding the impact of ABF are limited both by inevitable study design constraints (randomized trials of ABF are unlikely to be feasible) and by avoidable weaknesses in methodology of many studies. Further, the variation in results across studies suggests that the impact of ABF may vary across settings, though the evidence does not provide strong clues of the determinants of differential effects. The ABF story thus provides testimony to how modifications in health policy without adequate evaluation leave their impact open to great uncertainty. The most compelling evidence of any impact on ABF is on an initial,</i>
				4 non-pooled studies: 3 pre/post and 1 CBA (n=21 888)*	After period: ≤ 2 years after implementation: increase (2 studies, consistent) After period: > 2 years after implementation: no difference (2 studies, mixed)		
			Post-acute care mortality <i>Within 2 weeks, 30 days or 31 days</i>	3 pooled pre/post studies (n=5 204)	RR =0.80 (95%CI: 0.52 to 1.24); p=0.32; I ² =34%		
				1 pre/post non-pooled study (n=329)	No difference		
			Readmission <i>Within 7, 14, 28, 30, 60, 90 days or 1 year</i>	12 pooled pre/post studies (n=64 003)*	RR=1.04 (95%CI: 0.93 to 1.16); p=0.48; I ² =73%	None of the pre-specified sub-group analyses explained the high variability in findings across studies (some studies showing a	



Reference	Population	Intervention and comparator	Outcome of interest	Included studies in meta-analysis/SR	Impact	Remarks	Author conclusions
				13 non-pooled studies: 11 pre/post and 2 CBA (n=953 674)*	After period: ≤ 2 years after implementation: increase (modest variability) After period: > 2 years after implementation: no difference in US studies (high variability); increase in 2 international studies; decrease in 1 international study	significant increase and others a significant decrease in readmission rates)	<i>but likely not sustained, decrease in hospital length of stay following introduction of ABF, a possible increase in readmissions, and an increase in discharges to post-acute care. The latter impact may be restricted to the introduction of ABF in the US. Other effects are likely absent, or restricted to specific settings, and possibly manifest in different directions depending on the setting. Thus, the evidence on the variables we studied does not support either strong advocacy for, or strong rejection of, a change to ABF from other hospital funding methods.</i>
			Severity of illness	30 non-pooled studies: 29 pre/post and 1 cohort (n=944 326)*	Increase (high variability). After period: ≤ 2 years after implementation: increase in 9 studies, decrease in 3 studies, no difference in 3 studies and mixed results in 3 studies. After period: > 2 years after implementation: increase in 9 studies, decrease in 3 studies, no difference in 1 study and mixed results in 4 studies.	No difference between US and international studies.	<i>Those considering adoption of ABF should be aware of the probable increase in admissions to post-acute care and other possible unintended adverse consequences that may arise. A paucity of consistent and conclusive evidence on the outcomes we studied, however, does not allow a jurisdiction to predict if ABF would be</i>
			Discharge to post-acute care	22 pooled studies: 21 pre/post and 1 cohort (n=954 228)*	RR=1.24 (95%CI: 1.18 to 1.31); p<0.0001; I ² =99.7%	In a sub-group analysis, 28% relative increase in discharge to post-acute care in the 19 US studies (RR=1.28 (95%CI: 1.22 to 1.36); I ² =100%), but no difference in the 3	



Reference	Population	Intervention and comparator	Outcome of interest	Included studies in meta-analysis/SR	Impact	Remarks	Author conclusions
						international studies (RR =1.01 (95%CI: 0.94 to 1.09); I ² =86%). None of the other pre-specified sub-groups explain the remaining heterogeneity.	<i>harmless. To this extent, despite the long and extensive experience, changing to an ABF system represents a leap of faith."</i>
						14 non-pooled studies: 12 pre/post and 2 CBA (n=69 979)*	
						Increase (modest variability). After period: ≤ 2 years after implementation: increase in 7 studies, decrease in 1 study, mixed results in 1 study. After period: > 2 years after implementation: increase in 5 studies, decrease in 1 study, mixed results in 2 studies	
			Volume of care	26 non-pooled studies: 24 pre/post, 1 CBA and 1 cohort (n=954 556)*		No difference (high variability). After period: ≤ 2 years after implementation: increase in 6 studies, decrease in 8 studies, no difference in 3 studies and mixed results in 2 studies. After period: > 2 years after implementation: increase in 6 studies, decrease in 4 studies, no difference in 1 study and mixed results in 1 study.	No difference between US and international studies.
Pott et al. (2023)¹⁹	Human subjects; any age; all ethnicities; all	PPS versus other PPS or alternate system	Length of stay	12 non-pooled studies	Ten out of 12 studies identified a decrease in length of stay	One possible explanation [for a decrease in in-hospital mortality] is a decrease	<i>"In this systematic review, we synthesized evidence of 64 studies examining the impact of</i>



Reference	Population	Intervention and comparator	Outcome of interest	Included studies in meta-analysis/SR	Impact	Remarks	Author conclusions
	geographical areas					in length of stay. Hospitals might discharge patients earlier and shift them to post-acute care. Twelve of the studies that present results on in-hospital mortality also investigate length of stay.	<i>the introduction of PPS and price changes within PPS on key outcome quality indicators operationalizing patients' health status and user evaluation. Based on our results, we do not find strong evidence in favor of one of the argumentations described above. Claims that PPS either cause great harm or significantly improve the quality of care are not supported by our findings. However, results also suggest that there may have occurred a shift towards discharges to post-acute care settings. Thus, decision makers that aim to implement PPS in an inpatient setting should consider their post-acute care capacities.</i>
			Mortality	35 non-pooled studies: 21 pre/post, 12 CBA and 2 cohort (n=24 101 927)	The majority of studies (31 studies, 47 analyses) does not find a statistically significant effect, does not test for significance or finds mixed evidence on mortality outcomes following the introduction of PPS. Significant decrease is found in 4 studies (6 analyses) and significant increase is found in 5 studies (5 analyses).	There seems to be a tendency for the five high quality studies to show a reduction in mortality, while the 22 low quality studies tend to show an increase. Results for the eight studies with a moderate quality are mixed. Results indicate that in-hospital mortality decreased, while out-of-hospital and post-acute mortality increased.	<i>To evaluate outcome quality of care a guideline-based approach as proposed by Campbell et al. (2002) is desirable. In the future, literature should evaluate quality in response to PPS incentives by quality indicators, which are developed based on</i>
			Readmission	33 non-pooled studies: 20 pre/post, 12 CBA and 1 cohort (n=74 698 964)*	8 analyses (7 studies) identify a statistically significant decrease in readmission; 5 analyses (5 studies) identify a statistically significant increase. 38 of the readmission analyses do not yield a significant change in readmission rates or showed mixed evidence.	All of the studies identifying an increase in readmission rates investigate readmission between 30 and 42 days. None of the analyses showing a statistically significant increase in readmission rates use data from the US.	
			Complications	7 non-pooled studies: 6 pre/post and 1 CBA (n=82 140)	Most of the analyses (18 analyses) suggest that the introduction of a PPS did not have a significant	The evidence for an increase in complication rates should be interpreted with caution	



Reference	Population	Intervention and comparator	Outcome of interest	Included studies in meta-analysis/SR	Impact	Remarks	Author conclusions
					effect on complication rates; 1 study identifies a significant increase in the percentage of patients without any complications; 1 study finds a significant reduction in inpatient complications; 1 study provides evidence for an increase in complication rates	as the risk of bias is high (no control for the severity of the underlying disease and the presence of comorbidities)	<i>medical guidelines. This is not the case in the presented studies. Moreover, evaluations reporting on user evaluation and symptom relief are rare and future research should also focus on these indicators, as they might substantially contribute to the understanding of the impact of PPS on quality of care. Also, there not many studies exist that evaluate price changes within a PPS. High quality studies in this field would increase the understanding on marginal and average reimbursement effects, which might help policy makers to improve PPS based reimbursement systems."</i>
			Condition at discharge	9 non-pooled studies: 7 pre/post, 1 cohort and 1 undetermined (n=70 456)*	The majority of studies tends to show a negative effect on discharge ambulation outcomes. 1 study finds significant decrease, 1 study finds significant increase.	A possible explanation [for the negative impact] is that almost all of the studies, which also investigate changes in length of stay, find that patients are discharged from hospital earlier. When excluding studies with low quality, no statistically significant effect was identified. Both studies detecting statistically significant effects did not control for any confounders, resulting in a high risk of bias.	
			Discharge destination	15 non-pooled studies: 10 pre/post, 4 cohort, 1 undetermined (n=21 320 937)*	Three analyses (three studies) find a significant reduction in the proportion of patients being admitted to their home and being able to care for themselves. Of the 6 analyses (5 studies) investigating changes in the proportion of patients		



Reference	Population	Intervention and comparator	Outcome of interest	Included studies in meta-analysis/SR	Impact	Remarks	Author conclusions
						discharged to home with the help of a home health care agency, 1 finds a significant increase and 1 a significant decrease. The others do not report statistical significance or results are not statistically significantly different from zero. 5 studies investigate outcomes of changes in discharges to nursing homes. 2 of them find a statistically significant increase in nursing home discharges, 1 found a significant increase in discharges to skilled nursing home however, only on a 10% significance level.	
			Emergency department visits	2 non-pooled studies: 1 pre/post and 1 cohort (n=79 880)	None of the studies finds an overall significantly positive or negative effect.		
			User evaluation	4 non-pooled studies: 2 pre/post, 1CBA and 1 cohort (n=40 105)	3 studies find NS reduction in satisfaction. 1 study detected a significant reduction in one of the 17 satisfaction outcomes considered (satisfaction with treatment on arrival by nurses)		



Reference	Population	Intervention and comparator	Outcome of interest	Included studies in meta-analysis/SR	Impact	Remarks	Author conclusions
Zhao et al. (2024) ²¹ [restricted]	Inpatients of any gender and age undergoing cholecystectomy	Prospective vs traditional payment system	Length of stay	3 pooled pre/post studies (n=73 214)*	SMD=0.62 (95%CI: -1.54 to 2.79); I ² =100%		"Transitioning from FFS to PPS resulted in no significant changes in LOS and mortality. However, there were minor increases in admission and readmission rates and a decline in financial margins. Specifically, switching from FFS to DRG-case payment demonstrated contrasting outcomes for different cholecystectomy procedures. For [laparoscopic cholecystectomy], this switch led to a reduction in LOS without impacting mortality rates, alongside an increase in financial margins. For [open cholecystectomy], there was an observed increase in LOS, which was also accompanied by a rise in financial margins. Moving from FFS to EBP revealed no significant alteration in admission rates but a slight increase in financial margins."
			Mortality <i>Postoperative mortality following cholecystectomy</i>	2 pooled pre/post studies (n=47 705)	OR=0.96 (95%CI: 0.66 to 1.42); I ² =0%		
			Readmissions	1 pre/post study (n=1 698)	4.7% increase in readmission rates for cholecystectomy		
			Hospital costs	1 pre/post study (n=46 015)	Significant reduction in costs for laparoscopic cholecystectomy; significant increase in costs for open cholecystectomy.		
			Financial margin	3 non-pooled pre/post studies (n=28 704)*	Decrease in actual hospital income in 1 study; increase in financial margins in 2 studies		
			Admissions <i>For cholecystectomy</i>	3 non-pooled pre/post studies (n=27 199)*	Slight increase in 2 studies, no difference in 1 study		

* Number of patients not reported in some studies. DRG = Diagnosis related group; PPS = prospective payment system; COPD = Chronic obstructive pulmonary disease; FFS = fee-for-service; CBA = controlled before-after; SMD = standard mean difference; RDC = relative difference change; DID = difference in differences; RR = relative risk; NS = non-significant; LOS = length of stay; ACE = Acute Care Episode, EBP = episode-based payment.



4.3.4.2 Length of stay

In three meta-analyses the introduction of DRG-like prospective payment systems significantly reduced LOS, although not always for sub-analyses.^{20, 24, 25} In Meng et al. (2020), a meta-analysis of 13 pooled studies showed a significant decrease in the LOS, but the meta-analysis focusing on eight CBA studies yielded a non-significant result.²⁵ Similarly, in Chen et al. (2023), a meta-analysis of 17 pooled studies showed a significant decrease in the LOS, but the meta-analysis focusing on five CBA studies yielded a non-significant result.²⁴ In subgroup analyses, they found a LOS reduction for appendectomy, but not for pneumonia, heart failure or COPD. Lino et al. (2023) also found a significant reduction in LOS for appendectomy patients.²⁰ Zhao et al. (2024) performed a meta-analysis, that found a non-significant LOS reduction for cholecystectomy patients.²¹ However, the latter meta-analysis included only three studies.

In systematic reviews without meta-analysis also a reduction of LOS linked to the DRG-payment was identified. In one pre/post study referenced by Agarwal et al. (2020), the mean LOS significantly decreased after the introduction of the Acute Care Episode demonstration in the US.²⁷ In Barouni et al. (2021), the LOS was reduced in 15 of the included studies and unaffected in the three remaining studies.²³ Similarly, twelve of the studies included in Pott et al. (2023) that studied in-hospital mortality, also investigated LOS.¹⁹ In ten of them, a decrease in LOS was identified. In the review of Brown et al. (2022) on stroke patients, only one study evaluated the impact of prospective payment on hospital LOS.²² This study did not detect any change in acute LOS.

It is worth noting that, in sub-group analyses, LOS results differed by length of implementation of the DRG payment system.^{24, 25} It seems that DRG-payments are associated with a rapid significant reduction of LOS, but that the effects might decrease over time.

4.3.4.3 Mortality

Prospective payment does not seem to be associated with changes in mortality, as shown by non-significant results in the meta-analyses carried out by Chen et al. (2023), Zhao et al. (2024) and Palmer et al. (2014) as well as in the pre/post study identified in Agarwal et al. (2020).^{21, 24, 26, 27} In a non-pooled analysis, two of the studies included in Palmer et al. (2014) showed an increase in acute care mortality soon (maximum two years) after the adoption of activity-based funding.²⁶ However, no effect was found for acute care mortality when analysing a period more distant from the implementation (more than two years). Also, no effect was found for post-acute mortality.

Two of the selected reviews identified a possible reduction of mortality associated with the introduction of a prospective payment system, but this result concerns a limited number of studies.^{22, 23} In the review of Barouni et al. (2021), only four studies found a significant decrease in mortality associated with DRG-based payment, while in 10 studies the results for mortality were non-significant.²³ Among the two relevant studies in Brown et al. (2022), one study showed a significant decrease in 30-day stroke mortality while the other showed a non-significant impact.²²

Also in Pott et al. (2023) a potential reduction of mortality was detected, when focusing on the five high quality studies included in the review.¹⁹ Otherwise, the vast majority of the studies included in the review either showed a non-significant impact, did not test for significance, or found mixed results. A significant decrease was found in four studies and a significant increase in five studies. Results indicate that in-hospital mortality decreased, while out-of-hospital and post-acute mortality increased. One possible explanation for the decrease of in-hospital mortality might be the decrease in length of stay: as patients are discharged earlier, they are less likely to die during their (shorter) hospital stay.



4.3.4.4 Readmissions

All included reviews evaluated the impact of prospective payment systems on readmissions. Overall, our review of reviews shows mixed results as did many of the included reviews.^{19, 23, 26}

A non-significant effect was found in two meta-analyses.^{24, 26} In the two relevant studies selected from Brown et al. (2022) on stroke patients, reduced readmission rates were identified.²² Also in one of the relevant studies identified in Agarwal et al. (2020), a significant reduction of readmission rates was associated with the Acute Care Episode demonstration for orthopaedic surgery patients.²⁷

But a number of reviews indicated that readmission rates might have increased under prospective payment systems. In particular, in a meta-analysis of four studies on cholecystectomy patients, Lino et al. (2023) detected a significant increase in readmissions in the DRG model compared to the FFS model.²⁰ Similarly, the meta-analysis of five studies by Meng et al. (2020) showed a significant increase in readmissions.²⁵ The one relevant study selected from the Zhao et al. (2024) review on cholecystectomy patients also points to an increase in readmissions.²¹

4.3.4.5 Other quality of care outcomes

Along with mortality and readmission rates, several other outcomes (complications, disposition at discharge, etc.) are measured to study the impact of a DRG payment system on quality of care.

The three reviews investigating complications demonstrated that the introduction of a prospective payment system did not have a significant impact on complications.^{19, 20, 27} Only one study included in the review of Pott et al. (2023) provided indications for an increased complication rate, but this study was judged to be at high risk of bias due to the absence of control for the severity of the underlying disease and for comorbidities.¹⁹ In this review also, two studies indicated a significant decrease in complications, but most of the included studies found a non-significant effect.

Pott et al. (2023) also investigated the impact on health condition at discharge.¹⁹ The majority of the included studies indicated a negative impact of prospective payment systems on the studied outcomes (ambulation at discharge, maximum distance walked, etc.), but this might be explained by the fact that patients tend to be discharged earlier (reduced LOS). Also, when excluding low quality studies, no significant impact was found.

Looking at the introduction of activity-based funding in older studies (1980-2012), Palmer et al. (2014) found mixed results regarding the impact on severity of illness, both early (maximum two years) after implementation and later on (two years or more after implementation).²⁶ Also, they found no difference between the US and other countries included in their review.

4.3.4.6 Costs

Six reviews included costs-related outcomes showing mixed results. Except in Barouni et al. (2021)²³ and Meng et al. (2020)²⁵, the number of studies included in the reviews is generally limited (one or two studies). From the seven studies included in Barouni et al. (2021), four indicated reduced costs while three pointed to increased costs.²³ In Meng et al. (2020), only four studies reported statistical significance, two of them showing a decrease in total inpatient spendings per admission associated with DRG-payment, while the other two found a non-significant impact.²⁵

In the review from Brown et al. (2022), one pre/post study evaluated the effects of the US Tax Equity and Financial Responsibility Act in rehabilitation hospitals using data from 1987 to 1994, and reported an increase in total inpatient rehabilitation spending.²² From the two relevant studies in Agarwal et al. (2020), one found no significant difference in spendings for inpatient hospitalisation associated with the Acute Care Episode demonstration in the US; while the other did not test for significance.²⁷

Zhao et al. (2024) found a significant reduction in hospital costs for laparoscopic cholecystectomy and a significant increase for open cholecystectomy.²¹ Lino et al. (2023) found non-significant impact of the DRG-model on costs associated with appendectomy.²⁰



4.3.4.7 *Impact on other settings*

In response to a decreased length of stay under case-based payment systems, hospitals may increase outpatient visits or consultations to maintain quality of care. Patients themselves may seek for more follow-up contacts after an early discharge. However, no significant impact of prospective payment systems was found on outpatient visits or consultations.^{20, 23}

Similarly, the impact on emergency department visits was evaluated in three reviews, two of them showing no significant effect.^{19, 27} Barouni et al. (2021) identified three studies that examined the impact of DRG reimbursement on emergency admissions, two of which showing a reduced rate of emergency admissions after the implementation and one study showing no change.²³

The use of ICU and CCU services was analysed in three studies identified by Barouni et al. (2021).²³ The results are mixed as one study reported a decrease in ICU and CCU use, one study reported no change and one study reported an increase.

As hospitals are incentivised to discharge patients earlier when the payment they receive is fixed per case, they are also incentivised to discharge patients (who are not ready to be discharged to home) to other post-acute care facilities. In a meta-analysis of 22 studies published before 2013, Palmer et al. (2014) showed evidence for a significant increase in the proportion of patients discharged alive to post-acute care (intermediate care facilities, nursing homes, skilled nursing facilities, in-patient rehabilitation facilities, long-term care hospitals, home health agencies and similar facilities in other countries) rather than to home.²⁶ In a sub-group analysis they found a significant increase in the 19 US studies but no significant impact in the three international studies. In a non-pooled analysis of nine studies (all US), seven studies reported that early after the activity-based funding implementation there was a large increase in discharge to post-acute care, but only one study reported statistical significance. One study reported a large decrease in discharge to post-acute care without reporting an associated p-value and one study reported mixed results. Looking further after implementation, in a non-pooled analysis of eight studies (all US), five reported an increase in discharges to post-acute care (all without statistical

significance), one reported a large significant decrease and two reported mixed results.

One study identified in Brown et al. (2022) regarding stroke patients detected an increased likelihood of discharge to post-acute care in the DRG model while another study showed an increase in post-acute care LOS.²² However, one study selected in Agarwal et al. (2020) reported a significant reduction in post-acute care spending after the implementation of the Acute Care Episode demonstration.²⁷

Barouni et al. (2021) identified five studies that reported a shift of costs to other centres after the DRG implementation.²³ In two other studies the referral rate of patients with high expenses did not significantly change.

4.3.4.8 *Volume*

Studies regarding the impact of prospective payment systems on volume of care showed mixed results. Approximately the same number of studies selected in Palmer et al. (2014) showed an increase and a decrease both early and late after the implementation of activity-based financing.²⁶ No difference was identified between US and international studies. Most of the included studies did not report statistical significance. Among those that did, one study reported a significant increase in volume early after the implantation of activity-based financing, one reported a significant decrease early after the implantation and one reported a significant decrease late after the implantation. Barouni et al. (2021) also found mixed results, three studies showing that the implementation of a DRG-payment mechanism reduced the admission rate and three studies reporting an increased admission rate.²³ In one study, the effect was different in different age groups (decrease for patients under 70 years and increase for patients aged 70 years and older). For cholecystectomy admissions, Zhao et al. (2024) identified two studies that indicated a slight increase following the implementation of a prospective payment system and one study with no significant impact.²¹



4.3.4.9 Users' satisfaction

The impact of prospective payment systems on users' satisfaction is only investigated in the Pott et al. (2023) review.¹⁹ They identified four studies investigating this outcome, all of moderate or low quality. One study looked at the introduction of capitation payment instead of FFS and found no statistically significant effect on patient satisfaction. One study investigated whether the introduction of a DRG-payment system instead of FFS had an influence on the satisfaction with doctors and found no statistically significant effect. In one study, among the 17 satisfaction outcomes considered, only one (satisfaction with treatment on arrival by nurses) showed a statistically significant decline after the introduction of DRG payment. Finally, one study reported that the implementation of a DRG-based payment system had no demonstrable impact on patients' perceived quality of life (one- and six-weeks post-discharge).

4.3.4.10 Other outcomes

Other outcomes were also investigated (not shown in Table 8). In particular, Barouni et al. (2021) investigated the impact of DRG-payments on capacity utilisation using indicators related to medication use, diagnostic or therapeutic methods, the number of physicians and nurses per hospitalised patient, etc.²³ Two studies showed that the rate of medication prescribing or administration remained constant and two other studies reported that these rates decreased after the DRG payment implementation. The rate of surgery was investigated in three studies, all of which showed a reduction after the DRG payment implementation. A study also showed a reduction in laboratory and imaging tests rates. One study showed that the number of nurses was reduced after the implementation of a DRG mechanism, while the number of physicians was increased. Zhao et al. (2024) explored the impact of a prospective payment system for cholecystectomy on hospital income.²¹ The results were mixed as two studies reported an increase in financial margins and one study showed a decrease in actual hospital income.

4.4 Discussion

The vast majority of included reviews concluded that the introduction of DRG-like prospective payment systems results in a reduced length of stay, which is consistent with theoretical incentives of case-based payments. As providers receive the same payment independent of the patient's length of stay, they are encouraged to discharge patients earlier in order to decrease costs, which improves efficiency.

However, one of the potential adverse effects of prospective payment systems is a decrease of quality of care. As providers are incentivised to reduce costs, they might discharge patients too soon or in uncertain conditions, or might reduce tests and procedures during the patient's stay. Several studies used mortality (during the patient's stay or shortly after) as a proxy indicator of quality of care. According to the included reviews, prospective payment does not seem to be associated with an increase in mortality.

Proponents of a prospective payment system argue that this payment system might in fact improve the quality of care, as hospitals are incentivised to invest in quality improvement that may turn into cost reductions.²⁸ Such effect might be difficult to detect using mortality as indicator of quality of care, especially for pathologies already associated with low mortality. Nevertheless, our review identified partial evidence of a possible reduction of mortality.

Readmission rates are also commonly used as an indicator of quality of care, although this measure has been criticised to be insufficiently sensitive to changes in quality of care.²⁹ Our review showed mixed results regarding readmission rates, as did many of the included reviews. Also, for some conditions, planned readmissions may be part of the scheduled follow-up care that is set up in response to early discharge.²⁵ In that case, readmissions are not an indication of reduced quality of care, but rather of changes aiming at improving quality. Unfortunately, none of the included reviews explicitly distinguished planned readmissions from unplanned readmissions.



The impact on readmission rates may depend on the organisation of post-acute care in the particular context. In situations where the supply for post-acute care is scattered, the introduction of DRG-like payments may induce more acute care readmissions than in situations where patients can be discharged to post-acute care settings rather than to home.^{19, 26} Pott et al. (2023) pointed out that, among the included studies that reported a significant increase of readmission rates, none is taking place in the US, where activity-based financing has been shown to increase discharges to a post-acute care setting.¹⁹

In addition, the impact on readmission rates may be difficult to detect in studies using claims or official data.¹⁹ Prospective payment systems often include a 'case consolidation' when patients are readmitted shortly after discharge, so that the readmission is incorporated in the initial case and does not lead to a new case-based payment. Case consolidations are not always identifiable in claims or official data, so that short-term readmissions may be difficult to pinpoint.

It is also worth noting that readmission rates are not independent of mortality rates, although they are both used to measure quality of care. An increase in mortality rates could lead to a decrease in readmission rates.¹⁹

In response to a decreased length of stay under case-based payment systems, quality of care may be maintained by relying on other services (outpatient consultations, emergency services, etc.) but our review did not identify a significant increase in the use of these services. Also, as hospitals are incentivised to discharge patients earlier, they are also incentivised to discharge those who are not ready to be discharged to home to other post-acute care facilities. Our review identified some evidence of this effect, particularly in the US. Earlier discharge to post-acute care facilities is not necessarily detrimental to the quality of care, especially in those regions where there is sufficient post-acute care capacity to satisfy the demand.²⁶ A more intensive use of post-acute care capacity may also prevent readmissions in acute care settings.²⁶

Ultimately, there is a concern that DRG-based payment systems theoretically would incentivise hospitals to expand the volume of activity in order to increase their revenues. Our review showed mixed evidence regarding the impact of DRG payments on hospital volume (number of admissions). A possible explanation is that DRG systems are accompanied by control mechanisms intended to limit the incentive to increase volume. However, these mechanisms, such as volume or tariff caps, were not specifically addressed in the included reviews.

Our review of reviews as well as the included studies present a number of limitations. First, DRG-like payment systems are comprehensive mechanisms whose details vary between programmes and countries. Also hospital funding reforms are rarely implemented as a separate intervention and are often accompanied by other mechanisms, such as control mechanisms. The primary studies included in the selected reviews took place in different contexts, so that it is difficult to conclude whether the identified results are due to the implementation of the DRG payment system as a whole or to particularities of the considered programme. In addition, some of the included reviews, in particular Pott et al. (2023)¹⁹, cover prospective payment systems that are broader than only DRG-based payment systems. Second, many studies investigated prospective payment systems in the US context, which is quite particular with respect to the organisation of post-acute care (e.g. existence of post-acute services). This country also has a longer history of DRG use than most countries. In the US, DRG-based payments replaced FFS payment mechanisms, whereas in other countries they replaced global budgets. Therefore, extrapolation to other contexts is not always possible. Third, a large part of included studies are before-after studies, without control group. Therefore, impact on the identified outcome may be the result of temporal trends independent of the payment system. In addition, the included reviews, and the studies within each review, cover different periods of time. Comparison might be affected by general trends in improved quality of care and decreased length of stay that are independent of the payment system. Fourth, among the nine systematic reviews included in this review, only five performed meta-analyses, and not for all studied outcomes. Moreover, these meta-analyses sometimes pooled very heterogeneous studies which can compromise the validity and reliability of meta-analytic results. Finally,



although an extensive literature search was performed, unpublished reviews or reviews published in grey literature were not included. Therefore, relevant policy reports and evaluation studies that were not published in scientific journals may have been overlooked. Also, each included review potentially suffers from a publication bias, as only published evidence could be included. Reviews published in other languages than English, French, German or Dutch were excluded. Similarly, within selected reviews, exclusion criteria based on language operated.

5 IMPLEMENTATION OF CASE-BASED HOSPITAL PAYMENTS IN BELGIUM: POINT OF VIEW OF EXPERTS AND STAKEHOLDERS IN BELGIUM

5.1 Introduction

Despite a significant portion of the Belgian hospital budget (BFM) being allocated to hospitals through a Diagnosis Related Group (DRG) system (see Chapter 2), Belgium has no cost-based prospective payment system for DRGs. In this chapter, we explore expert opinions on the feasibility and desirability of introducing control mechanisms within the Belgian healthcare context, assuming the implementation of a cost-based prospective payment system. Transitioning from the current model – characterised by a fixed macro-budget distributed among hospitals according to a complex set of rules – to an open-ended prospective DRG-based case payment system could potentially lead to unsustainable macro-level expenditures. To mitigate the risk of overspending, countries employing DRG systems implement control mechanisms tied to tariffs and/or volumes (see Chapter 3). Drawing on these international examples, we engaged with Belgian experts to assess the relevance of such mechanisms in Belgium. Our research questions are:

- How do Belgian experts perceive the feasibility and desirability of implementing control mechanisms as seen in the selected countries?
- What preconditions must be met for each of these mechanisms?
- What is their preferred model?



5.2 Method

5.2.1 Introduction

Addressing the research question necessitates a robust set of technical skills, including expertise in Belgian and international hospital payment systems, health economics, macroeconomics, quality of care and data systems. To facilitate this, we employed a modified 'nominal group approach', recruiting content experts to participate. The nominal group received the results from the international comparison, delivered through a PowerPoint presentation with voiceover. Their task was to evaluate the desirability of the accountability mechanisms – considering factors such as risks, benefits, implementation challenges, acceptability, and prerequisites for successful adoption – within the Belgian healthcare context.

Box 1 – Definition nominal group technique

'Nominal group technique (NGT) is a structured variation of a small-group discussion to reach consensus. NGT gathers information by asking individuals to respond to questions posed by a moderator, and then asking stakeholders to prioritize the ideas or suggestions of all group members. The process prevents the domination of the discussion by a single person, encourages all group members to participate, and results in a set of prioritized solutions or recommendations that represent the group's preferences'.³⁰

5.2.2 Targeted profiles for the modified nominal groups

We conducted two nominal group sessions in the week of 14 October 2024: one with French-speaking experts and another with Dutch-speaking experts. To ensure a diverse range of insights, we outlined necessary profiles and recruited participants from our professional network. We aimed to strike a balance between academic professionals and practitioners, including:

- Health economists
- CFO: Chief Financing Officers

- CEO: Chief Executive Officers
- Experts health services research with expertise in payment systems, expert in quality of care with notion of the payment system
- Experts from the Federal Public Service of Public Health.

For each of the profiles we listed at least two options. Invitations were sent by email.

5.2.3 Approach used during the nominal group meetings

To prepare for the meeting, the KCE team outlined three models on a whiteboard – price adaptations, volume adaptations, and volume-price adaptations – summarising the options identified through the international comparison (see Box 2). Participants were invited to reflect on the potential advantages, disadvantages, and preconditions associated with each model at the national, regional, loco-regional hospital network, and individual hospital level. Additionally, a blank whiteboard was provided to capture any insights not covered by these three models.

The two-hour nominal group meeting was moderated by a KCE expert and was structured as follows:

- Individual reflection (20 minutes): Each participant was asked to consider the advantages, disadvantages, and preconditions associated with each model, writing advantages on green post-its, disadvantages on red post-its, and preconditions on orange post-its, using one post-it per idea.
- Plenary session (60 minutes): Participants took turns presenting one idea at a time, ensuring that previously mentioned ideas were not repeated. This process was conducted for advantages (20 minutes), disadvantages (20 minutes), and preconditions (20 minutes).
- General discussion (20 minutes): Following the presentations, a discussion was held. Each expert received a green and a red post-it to indicate their preferred model and the model they would not choose.



- **Wrap-up:** The meeting concluded with a summary, allowing experts to voice any additional ideas or concerns not previously addressed.

Box 2 – Control mechanisms in DRG systems

- **Tariff cap:** This mechanism imposes a (linear) reduction in the payment rate per DRG once the allocated budget limit is surpassed, thereby reducing the financial impact on the overall budget while maintaining some level of reimbursement for each case.
- **Volume cap:** Under this mechanism, a strict limit is set on the number of hospital admissions. Once this threshold is exceeded, hospitals receive no further payments, creating a direct volume constraint on hospital admissions within the budgeted period.
- **Volume-price cap:** This hybrid model combines aspects of both the tariff and volume caps. Hospitals receive progressively reduced payments for each additional admission after a certain threshold is reached. While payments continue, they decrease in a controlled way as the volume grows beyond the predefined limit.

Each of these mechanisms can be applied at varying administrative levels – national, regional, hospital network, or individual hospital. However, as application moves from national to more localised levels, the complexity of managing and monitoring these controls increases significantly.

It should be noted that this script was not strictly followed in the Dutch-speaking group. Experts felt it necessary to formulate comments outside the exercise (see results section) leaving less time to follow the script. Respondents were asked to put the post-its that were not discussed on the whiteboards so the researchers could use this information in the analysis. While also in the French-speaking group many comments outside the exercise were voiced, the script could be followed more strictly.

Two observers recorded notes during the meeting, which was also audio-recorded. This material was used to compile the results section, written by one researcher and reviewed by two others who attended the meeting. The

draft was then sent to the participating experts for feedback, allowing them to add insights or correct any misinterpretations.

In addition to the nominal groups, a comprehensive stakeholder meeting was conducted, featuring an in-depth presentation of the international study findings, the expert panel's report, and recommendations. Stakeholders had the opportunity to engage during a Q&A session and could submit comments to the KCE in the week following the meeting.

5.3 Results

Disclaimer. The reader should be aware that this chapter is based on the opinions of the consulted stakeholders and experts. Hence, statements are solely based on expert and stakeholder opinions stated during the expert panels and stakeholder meeting and not on verified facts.

5.3.1 Participants

In total 16 experts (8 Dutch-speaking and 8 French-speaking experts) participated representing the following profiles: 3 health service researchers; 4 CEOs; 2 representatives of public authorities, 1 CMO, and 6 CFOs or staff working in the financial department of a hospital.

5.3.2 General feedback

In addition to discussing control mechanisms for macro-level hospital budget control, the panellists shared a broader range of reflections on the current state and future of the DRG-based payment system in Belgium. Their comments touched on Belgium's position relative to other countries, the calculation method of tariffs, the risk to introduce more complexity in the payment system, decisions about financial incentives for physicians, the evolving nature of hospital financing models, and the potential need for more integrated and quality-focused approaches to healthcare delivery. Many experts expressed concerns about the complexity and challenges of making DRG systems work in practice. Below is a summary of the key themes that emerged from the discussions regarding the changing landscape of payment systems and the preconditions necessary for effective reform.



5.3.2.1 *General sentiment: lagging behind and missing momentum*

Many experts believe that Belgium is significantly behind other countries (by around 10-15 years) in its implementation and refinement of a prospective case payment system per DRG, based on costs. Some fear that the moment for this reform has passed, as other countries are either moving away from DRG systems or reforming them to include care beyond the hospital (such as episode-based payment models). The concern is that Belgium's healthcare sector is investing considerable time and resources into refining the B2-component (<40 of the BFM, the BFM in itself represents less than 40% of the hospital budget) of the payment system by shifting the payment based on length of stay towards a cost-based system. This will potentially result in an even more complex framework without meaningful progress toward integrated care which is hardly needed in the future. The panellists felt that the fundamental issues of healthcare system organisation are not being addressed through the DRG reforms (i.e. case-based payments based on costs per DRG) as currently planned.

5.3.2.2 *Financial risks and accessibility*

One significant concern raised was that 'all-in' DRG lump sums may not adequately account for the variability in costs based on the complexity of the pathology, the severity of the case, or the presence of comorbidities. If these factors are not sufficiently reflected in the DRG tariffs, there is a financial risk to hospitals, and potentially a risk of patient accessibility. Experts emphasised that while an all-in DRG payment system works well for highly standardised treatments with predictable costs, these cases make up only a small portion of all hospital admissions (i.e. the current system of low-variable care DRGs). For more complex cases, lump-sum payments could result in inadequate funding and jeopardise care delivery or hamper financial accessibility to care for patients with high expected costs. Furthermore, if specific and separate payment systems must be included for the more complex cases, hospital payment becomes even more complex.

5.3.2.3 *Price and volume calculation*

Panellists stressed the importance of basing DRG tariffs on actual costs to ensure fairness and accuracy in hospital payments. This is critical because DRG prices, under such a system, directly determine hospital budgets. There was a remark that a tariff calculation could also evolve towards evidence-based and appropriate pricing rather than basing tariffs on historical costs alone. Some also suggested to tie tariffs to minimum licensing standards, which would link hospital payments to the quality of care provided. This would help ensure that hospitals meet specific care standards, reducing the risk of cost-cutting measures that could compromise care quality. Yet, starting with current cost structures is in itself already very challenging. Therefore, the incorporation of evidence-based elements, which over time could indeed lead to more accurate and fair pricing, was deemed unrealistic as a first step.

Regular updates, using cost data from a set of reference hospitals, were suggested to ensure that the system reflects real-world changes in healthcare practice and thus cost changes: changes in healthcare delivery, inflation, and demand. In addition, outlier mechanisms are still needed under a DRG-based system with control mechanisms (e.g. exclude patients with highly variable care needs – since they require different payment mechanisms).

5.3.2.4 *The need for control mechanisms reduces when the DRG system is well designed*

There was a shared understanding that the better the DRG system is designed, the less reliance there will be on corrective control mechanisms. If DRG prices are based on responsible, evidence-based cost estimates (see remark about feasibility in previous paragraph) that align with the types of care public authorities wish to finance, fewer corrective mechanisms will be necessary. When these correct tariffs are combined with correct volume projections (e.g. based on demographic changes), the need of control mechanisms is small.



Panellists noted that control mechanisms should be reserved for situations where the system itself falls short, rather than being built into the system from the start.

5.3.2.5 *Exclusions and exceptions in DRG payments*

The trend in several countries to exclude more and more services (with nursing care in Germany as an extreme example) from DRG payments was also discussed. While this may ease financial pressures on hospitals and reduce the need for stringent control mechanisms, it risks undermining the purpose of DRG systems by fragmenting payments (resulting in an even more complex payment system) and distorting incentives. The more services that are excluded from DRG payments, the less risk hospitals face in exceeding the budget, but this could also weaken the DRG model as a comprehensive payment system.

There is a fear that the DRG-based payment system will focus only on the current B2 BFM-part. Setting up a cost-based DRG-system for only this part would require a lot of effort and would also induce an additional layer of complexity (e.g. control mechanisms) and it is questioned if this is worth the efforts. If the pathway of DRGs is followed also other parts of the BFM (e.g. B6, B9, healthcare staff fund (*Zorgpersoneelsfonds – Fonds Blouses Blanches*)) should be reviewed and considered for inclusion (or exclusion) in the new payment system.

5.3.2.6 *Decisions about physician fees are urgently needed*

Another key factor discussed was the issue of physician fees under a DRG-based payment system. The effectiveness of DRG systems hinges on whether physician fees are part of the lump sum. If DRGs only apply to the current BFM, their impact diminishes. There is still a lack of clarity around how these fees will be handled, and panellists stressed the need for clear

policy decisions. In a system where physician fees^b are excluded from DRG payments, the incentives for hospital management and physicians are misaligned. Hospital management is held accountable when mechanisms penalise excessive hospital admissions, but the decision to admit or not to admit rests with the physician. This disconnection creates tension, as hospitals bear the financial consequences while physicians face no direct control. The concept of 'pure physician fees', which compensate physicians for their intellectual and physical efforts separate from the DRG-system, was criticised by panellists. They argued that this approach shields physicians from control, potentially leading to conflicts between hospital management and physicians over admission decisions and financial pressures.

5.3.2.7 *Gradual implementation and preconditions for success*

A phased, gradual implementation of any reform to the DRG system was considered essential, giving hospitals time to adapt to the new model. This would prevent abrupt financial shocks and allow for adjustments based on early feedback. Moreover, a thorough reflection on which services and costs should be included in the DRG system was seen as a prerequisite for success. This includes ensuring consistency across services that fall outside the DRG system, such as physician fees.

5.3.2.8 *Alternative payment models*

Broader question: are DRGs the right path?

Several experts questioned whether Belgium's current trajectory of transitioning to a DRG-based system is still relevant (see section 5.3.2.1). Some pointed to other countries, like Germany, that have partially rolled back DRG financing. This prompted concerns that Belgium may be investing heavily in a system that other countries are moving away from, raising the question of whether alternative payment models, such as global budgets or

^b Especially when physician fees only cover the professional part of providing medical acts, and the part that currently is meant for operational costs is also part of the DRG case-based payment.



episode-based payments, might better meet the needs of the healthcare system.

A frequent criticism of the DRG system was that it does not provide adequate incentives for improving the quality of care or ensuring appropriateness of treatment. Several experts recommended moving toward a payment system that promotes more integrated care across settings, including hospitals, outpatient services, and general practitioners.

- Per capita

One suggestion was a per capita payment system, where a geographic region receives a per capita payment to cover the care needs of the local population, paired with shared savings and quality incentives. This approach would promote collaboration across healthcare providers and address the current fragmentation between hospital and outpatient care.

It was also suggested to calculate the required budget for a geographical region at the beginning of the year based on demographic characteristics and to use this budget to finance the healthcare services in the region. Yet, such a 'regional approach' also implicitly assumes that all forms of care are available (and in the 'right' capacity) in every region. In practice, this is certainly not the case, and with the increasing efforts for more concentration of certain care activities (mostly underpinned by evidence of a volume-outcome relationship) this will be even less the case in the future. For this type of services (in Belgium also called supra-regional services) patients will (partly) be treated outside the region where they live and by consequence an alternative payment model than a per capita payment within such a geographical entity needs to be applied.

- Episode-based

Another suggestion was to move towards episode-based payment systems, especially for elective care. The panellists highlighted the importance of considering both pre- and post-hospital care as part of the payment structure, aiming to minimise hospital stays while ensuring coordinated care within a regional context. They stressed that focusing solely on what happens inside the hospital is insufficient, as broader collaboration with

primary care and social services is essential for effective healthcare delivery. This approach would require the inclusion of social care services and new organisational models, which could be explored through pilot projects. This system is still a pathology-based system but covers not only the hospital episode but also the period before and after hospitalisation.

- Shared savings

The concept of shared savings was also discussed, where hospitals could retain part of the efficiency gains, but the challenge lies in aligning budgets across different sectors or keeping them separate initially. Advocates of shared savings emphasised the need for correct pricing as a precondition, allowing efficiency gains to benefit the sector. Hospitals could retain their budgets while collaborating with other actors, though it remains unclear whether different sector budgets would need to be aligned or kept separate at first – for example, supporting more outpatient care in case of a delivery and using hospital budgets to fund midwives, which crosses into the competency of both the federal and federated entities.

- Pay for performance and value-based care

A suggestion raised by the panellists emphasises the importance of payment incentives ensuring the appropriateness of hospital admissions from a medical perspective. This is crucial for preventing overproduction and substandard care. After all, concerns were raised about the inherent incentive in DRG systems to increase the number of hospital admissions, which can result in the hospitalisation of patients for conditions that do not require it. Avoiding unnecessary hospital admissions is nowadays even more relevant given the current staff shortages in many hospitals. To counteract inappropriate admissions, the panellists recommended a form of volume control at the point of admission, ensuring that only medically justified hospitalisations take place. Instead of making corrections after budget overruns, the panellists suggested that such corrections should be built into the design of the financing system itself – by incorporating mechanisms that assess the appropriateness of care and incentivise quality through P4P and other value-based strategies. Although this seems, theoretically, an attractive strategy, real world practice (and also reviews of



the available scientific evidence)³¹ shows how difficult it is to set up solid (e.g. 'SMART') P4P indicators.

They therefore also argued that a payment system should incentivise not only efficiency but also quality of care, shifting towards a value-based model. Rather than starting with a traditional DRG system, as other countries have done, Belgium could benefit from lessons learned over years of DRG financing elsewhere, integrating these insights to promote better care outcomes.

One suggested approach is to expand P4P mechanisms, which reward high-quality care. This would shift the focus away from simply controlling costs and instead foster care that is both effective and patient-centred.

- Outpatient care incentives

Panelists suggested to further incentivise outpatient care. Examples can be found in other countries stimulating outpatient care and day hospitalisations under the DRG system:

- Estonia: allows a volume transfer from inpatient to day hospitalisation but not the reverse under the volume-price control mechanism.
- France: utilises a single DRG tariff for both inpatient and day hospitalisations.

Budget guarantee to create a context to experiment

Some proposed a guaranteed budget for hospitals and networks for several years to explore alternative models aligned with new organisational forms and ways of working. However, concerns were raised about what would happen after this period if no substantial changes are made, potentially leading hospitals to harm their own interests.

5.3.3 Advantages – disadvantages – preconditions of control mechanisms

Below the advantages, disadvantages and preconditions are summarised for each of the three models (see for more details Appendix 2). From the expert panels it can be retained that the tariff reduction when applied at the national level mostly resembles the current mechanism in the BFM to adjust the value of a point when the budget at macro level is surpassed. Yet, it was not the preferred mode. After all, it will result in similar problems as the current BFM. Moreover, applying less generalised tariff reductions (e.g. at the hospital level network instead of nationwide) seems not feasible (e.g. too complex to manage). Neither were experts much in favour of volume caps as this would introduce either waiting lists or a huge increase in private healthcare. Moreover, such volume caps are difficult to manage. Volume caps would require a penalisation only in case of inappropriate admissions which is difficult and complex to implement in practice. While all control mechanisms offer distinct strategies for managing healthcare budgets, the volume-price cap model emerges as the most balanced approach, aligning closely with Belgium's healthcare system needs by combining financial control with the flexibility to meet patient demand. Such a system would moreover be difficult to implement in the actual Belgian healthcare system, with its extensive freedom of choice for both patients as well as referring physicians.

5.3.3.1 Tariff cap

A linear adjustment of tariffs carries low risks for public authorities, as it is a way to control the macro-level budget. In addition, the tariff cap offers a method to control costs without directly limiting hospital admissions, providing hospitals with greater flexibility to adjust services according to patient demand. In that sense it offers predictable financial structures for hospitals, allowing them to continue operations even if the national macro budget is exceeded, albeit at reduced tariffs. The latter is perceived as fair since, especially in case of larger volumes, the fixed costs are already covered. This cap also aligns, according to some respondents, more or less with Belgium's existing healthcare budget approach (both at RIZIV-INAMI where similar mechanisms are applied to sectoral budgets; as with the BFM



where the value of a 'point' is adapted linearly). By adjusting tariffs rather than restricting admissions, hospitals are incentivised to organise operations efficiently, maintaining service variety and avoiding delays for patients. Applying tariff caps at the level of hospital networks could result in collaboration between network partners but only if it concerns services available in all hospitals and if they work with a shared budget, which is currently not the case.

However, the tariff cap also introduces disadvantages, primarily related to the uncertainty of tariff adjustments and a disconnection between the costs and tariffs. Indeed, hospitals might be penalised by the behaviour of others (e.g. maximise hospital admissions including inappropriate hospital admissions resulting in macro-level budget derailments), which is not fundamentally different under the current system. Indeed, the BFM-system, under which a macro-level budget is allocated via justified beds, results in an incentive to maximise hospital admissions and minimize length of stay. Also in the BFM hospitals might be penalised by the behaviour of others when the value of a point is decreased. Hospitals, thus, may experience unstable revenue when adjustments are applied uniformly, disregarding regional needs or specific medical specialties or level of specialisation. Furthermore, a linear adjustment can disproportionately impact hospitals, especially if increases in the number of patient admissions are justified by local demand. It is quite possible that the patient pays the bill: e.g. increased supplementary payments; quality (when tariffs are reduced hospitals might cut corners reducing quality standards) or accessibility (i.e. patient selection) risks.

To counter these issues, it is crucial to establish preconditions: tariffs must accurately reflect actual treatment costs, be updated regularly, and include mechanisms that correct for changing needs (e.g. growth norm which allows to adjust for demographic changes) as well as for changes in medical practice and technology, changes in quality control to avoid potential cuts in care standards. Applying tariff caps at a lower level has theoretical advantages but seems unfeasible to achieve, especially when it concerns the hospital level.

5.3.3.2 *Volume cap*

A volume cap is a strict control that sets a predefined limit on the number of hospital admissions, beyond which hospitals receive no additional payment. Advantages of this model include its predictability, which stabilises hospital finances and reduces excessive admissions, aligning care volumes with patient needs (when volume thresholds are including accurate projections of population needs and take into account that some hospital admissions are 'unavoidable'). By focusing on service limits, hospitals are likely to reduce unnecessary admissions and to expand outpatient services and day cases when these services are adequately funded. Volume caps also mitigate inter-hospital competition for hospital admissions, which can reduce duplicative or inflated activities.

However, the disadvantages are significant: volume caps could encourage physicians to shift services to private care, potentially leading to a two-tiered healthcare system that limits access for lower-income patients. Moreover, setting volume caps at the national level could risk accessibility issues with delayed care and waiting lists. Especially smaller hospitals might struggle if admissions fall short of the cap, putting their financial stability at risk.

Preconditions for effective implementation of volume caps include adjustments for population health factors, the development of a methodology that allows to assess the appropriateness of hospital admissions and a different application for volume-caps of services available in most hospitals and services available in tertiary care hospitals only (so-called supra-regional services). Moreover, a system that allows flexibility for emergency demand increases (e.g. public health crisis) needs to be set in place. Also measures to prevent misuse of the system are necessary. Experts mentioned the risk of upcoding (e.g. shifting patients to another DRG by manipulation of the coding) when a volume cap is almost reached.



5.3.3.3 Volume-price cap

The volume-price cap model combines elements of both previous mechanisms, providing capped payments per admission that decrease once a specific admission threshold is met. This model is seen as a preferred option due to its potential to manage costs, admissions, and care quality without drastically limiting patient access. Advantages include a balance between budget control and flexibility; hospitals are incentivised to prioritise necessary admissions while avoiding cost cuts that would affect patient care quality or access to care. This approach promotes the use of outpatient or community-based care options and can reduce inter-hospital competition (especially when applied at hospital network level when a shared budget between network hospitals is installed).

However, disadvantages arise in the form of complexity and potential financial instability for hospitals with low volumes or high fixed costs. This also brings up the issue of the sustainability of small hospitals or programmes with low volume. Despite being at lower risk compared to the volume cap, also under this control mechanism waiting lists may grow when hospitals approach their cap limit, possibly leading to delays in care.

To maximise benefits, this cap model requires preconditions like accurate costing for variable versus fixed expenses, coding controls to prevent manipulation, and incentives for hospitals that improve efficiency and quality. Additionally, shared budgets for hospitals within hospital networks are needed when such caps are applied at the network level. Also regular review mechanisms are critical for adjusting caps to reflect changes in demand and demographics, enabling sustainable healthcare delivery across diverse regions.

6 DISCUSSION AND CONCLUSION

The Budget of Financial Means (BFM) is a closed-end budget with several parts and subparts, the largest of which (B2; 36.3% in 2023) covers costs for nursing, non-medical staff, and medical products. This B2 budget is also closed-end and allocated to hospitals based on the national average length of stay per APR-DRG/SOI. The current hospital payment system (not only the B2-part) faces several challenges: the system is seen as complex and opaque, with adjustments sometimes applied years later, creating uncertainty around financial outcomes. Next to the BFM, there are multiple funding sources covering various aspects of hospital costs (physician fees, operating expenses, drug costs, medical day cases, etc.) creating financial incentives that are not always fully aligned with those of the BFM.

The above and other challenges have prompted ongoing discussions about reform. A key component of the reform plans of the last three ministers of Public Health was a shift from the current hospital budget allocation to a DRG-based payment system per case. The introduction of the lump-sum payment (amount per patient group) for low-variable care was the first concrete step in the direction of an 'all-in' DRG-based payment per case. However, to further move towards a DRG-based payment per case with an expansion of the lump-sum payment to other APR-DRG/SOIs, or to broaden the scope of the lump-sum payment to the B2 and other parts of the current BFM instead of the physician fees only (current lump-sum payment for low-variable care), more (cost) data are needed.⁷ In the reform plans of the current minister of Public Health, it is foreseen that the tariff per APR-DRG/SOI will include care-related components currently financed by the BFM, as well as pharmaceuticals, medical devices, and part of physician fees (practice costs). Also in other countries, DRG-type payments are typically not all-inclusive but are combined with other forms of payments.

The transition from the current closed-end budget to a DRG-based payment per case carries the risk that hospitals will be incentivised to increase patient volumes. Without control measures at the macro level, this could lead to an increase in overall healthcare spending, as hospitals may seek to maximise income by admitting more patients or performing more procedures, even if they are not medically necessary.



The minister of Public Health commissioned KCE to provide recommendations on control mechanisms to prevent unnecessary hospital admissions and budget overruns in a DRG-based payment system per case.

6.1 Control mechanisms for DRG-based payment system per case: necessary to control the macro-level budget but many drawbacks mentioned by Belgian experts and stakeholders

To prevent budget overruns with DRG-based payments, countries can implement price and/or volume control measures to keep the hospital budget at the macro level under control. The countries that were studied in this report opted for different approaches (see Chapter 3). The specific choice of control mechanism plays a crucial role in determining whether priorities such as quality, efficiency, or accessibility are achieved, just as the design features of a DRG-based hospital payment system per case (see section 6.3 and 6.4).

6.1.1 *Hard budget caps with linear tariff reductions*

Price regulation mechanism is an incentive for volume increases in France

In France, the hard budget cap prevents the ONDAM budget to be overrun. A linear price reduction is applied to the tariff of all DRGs at the national level, with a few exceptions to align DRG tariffs with government public health priorities. The likelihood of exceeding the budget is highly dependent on the ONDAM target for hospital care. If the target is underestimated, as is currently the case, tariff reductions are the rule rather than the exception. A critique on the French system is that the ONDAM targets are based on a short-term approach without sufficiently taking population needs into account. Two major consequences are the regular tariff reductions since 2008 because activity volumes exceeded the targets, and the large number of hospitals (58% of public hospitals) that are in deficit. As a result, the gap between the price and cost per DRG continues to widen undermining the

advantages of a DRG-based payment per case based on costs. The system also loses transparency for the actors involved.

The French hospital payment system shares several features with the current hospital payment system in Belgium. For instance, the ex-ante defined hospital budget (the B2-part) can be considered a hard budget cap for Belgian hospitals. The national closed-end budget for B2 is allocated to individual hospitals by dividing the national hospital budget by the total number of B2-points 'earned' by all hospitals. This gives the monetary value of one B2-point. While a closed-end budget helps control healthcare costs at the macro level, the allocation rules within the BFM encourage hospitals to increase admissions to secure a larger share of the national budget. Another aspect of a closed-end budget is that a hospital's share depends not only on its own activity levels but also on the activity (such as reductions in length of stay) of all other hospitals. This collective accountability, with a reliance on the activity levels of other institutions, adds significant uncertainty, making it difficult for hospitals to predict their individual budgets. Also in France, the payment system (both the hard budget cap and tariff reductions) induces hospitals to focus more on volume than on efficiency or quality improvements, and shifts accountability away from individual hospitals. It is therefore questionable whether a case-based payment system with a linear price cap as control mechanism would be an improvement for the Belgian system, as the drawbacks observed in France are quite similar to several of the current disadvantages of the BFM system.

Accurate assessment of population needs required for sustainable macro-level budget control

According to Belgian experts and stakeholders, a hard budget cap with price reductions clearly has the potential to attain the efficiency goals of DRG-based payments per case at the macro level. Such system substantially mitigates the financial risk of DRG payments for payers. Moreover, it allows hospitals to adjust (the volume of) services to patient demand and avoid waiting lists, which is less the case with a volume cap. A tariff cap still offers a financial structure for hospitals, allowing them to continue operations even if the national macro budget is exceeded, albeit at reduced tariffs. It was emphasised that a budgeting based on an accurate assessment of



population needs and keeping pace with changes in medical practice and technology is essential to align the macro-level hospital budget with demand. This requires ongoing maintenance, much like the DRG payment system itself. While in France the system is applied at the national level, it could be considered to organise tariff caps at a lower geographical level (such as the locoregional hospital networks or another regional organisation of hospitals). It was noted that this could lead to collaboration among network partners, but only if they operate under a shared budget, which is not currently in place. Additionally, the more differentiated prices are and the more the system accounts for local activities and needs, the more complex it becomes to manage at the national level.

Tariff reduction disproportionately impacts smaller hospitals

A tariff reduction for DRG payments when the macro-level budget is overrun, can disproportionately impact hospitals. Smaller hospitals are more vulnerable than larger hospitals due to differences in how fixed and variable costs impact their financial stability. Smaller hospitals tend to have high fixed costs (for instance, building maintenance, equipment, basic level of staffing). These costs do not significantly vary with patient volume. Any reduction in DRG payments has a larger relative impact on their ability to cover these fixed costs. Larger hospitals have greater patient volumes, which makes they are better able to cover fixed costs even with a tariff reduction. They benefit from economies of scale, allowing them to spread fixed costs over a greater number of cases. Hence, a DRG tariff reduction impacts them less per case than it does for smaller hospitals which have lesser cases to distribute the fixed costs across. Of course, larger hospitals may incur more costly fixed expenses because of specialised equipment and extensive capital infrastructure.

6.1.2 Volume cap

Predictable limit on spending for payer and incentive for efficiency for hospitals

By capping the total volume of cases eligible for full DRG reimbursement (as in Estonia until 2006 and in Lombardy), governments can set a predictable limit on healthcare spending. This prevents the risk of budget overruns that can occur in systems with no upper limit on volume. Hospitals are incentivised to be more efficient within the capped volume, which may foster the development of care pathways, prioritise essential services and invest in day cases and outpatient services. A hard volume cap, especially when applied at the hospital level (and per medical specialism), discourages unnecessary admissions or treatments, as hospitals cannot increase revenue simply by increasing the number of cases.

A volume cap focuses the control on the number of admissions rather than the cost per admission, preserving the hospital's ability to provide appropriate care within each DRG payment. Therefore, in DRG-based payment systems per case with a hard volume cap, distinguishing between appropriate and inappropriate hospital admissions is essential to ensure that limited resources are used effectively. The consulted Belgian experts and stakeholders emphasised the importance of focusing the volume limitations on inappropriate admissions. Although several approaches and tools (for instance, clinical criteria and admission guidelines, audits, etc.) can partially ensure that clinically necessary and appropriate admissions are counted toward the cap, this is challenging in real practice. The most pragmatic way to implement volume caps and taking into account a degree of 'appropriateness of hospital admissions' is probably to list DRGs for which volume caps do not apply since their admissions are difficult to 'control' (e.g. vaginal delivery). Another element is the dual payment structure of DRGs for hospitals and fee-for-service for medical specialists (like in Belgium), which introduces complex financial incentives. Hospitals are incentivised to limit admissions to stay within the volume cap, while specialists may push for more treatments and admissions to maximise their income. This misalignment between payment models can create tension, leading to



unnecessary hospitalisations, prolonged stays, or undertreatment, and complicates efforts to determine whether an admission is truly necessary.

The appropriate distribution of a national or regional volume across hospitals is challenging. In Lombardy, this distribution is based on historical hospital activity. A volume cap applied to a regional level smaller than the current regions but larger than individual hospital networks could help address practice variations (e.g. in procedures like hip replacements) between hospitals. However, this is more difficult to manage for other, less standardised, types of treatments.

A threat to accessibility: waiting lists and selective provision of services

Setting volume caps at the national level could pose risks to healthcare accessibility, potentially leading to delayed care and extended waiting lists. When volume caps are applied at the level of hospital networks or individual hospitals, patients may experience long wait times or may need to travel farther to access care. Additionally, hospitals might attempt to circumvent volume limits by shifting services outside the DRG system or into private care.

Physicians may increasingly shift their work to private practice once volume caps are reached, which could accelerate the growth of a dual public-private healthcare system. In Lombardy, for example, the hard volume cap created challenges in healthcare delivery: a small increase in high-reimbursement procedures significantly impacted the budget, resulting in a reduction of many low-reimbursement procedures and the emergence of waiting lists. Hospitals might focus on more profitable DRGs within their capped volume, potentially underserving patients with complex or costly needs. In the long term, such selective provision can undermine the goal of equitable healthcare access and can lead to inefficiencies or inequities in the treatment patients receive.

Fixed volume caps lack flexibility, making it difficult to adjust to changes in healthcare demand due to seasonal illnesses, local outbreaks, or demographic shifts. Hospitals may face challenges when case volumes suddenly increase. Especially smaller hospitals with limited case volumes

may find it challenging to maintain financial stability if they are forced to stay within tight volume limits. These hospitals might lack the flexibility to absorb fixed costs with reduced case numbers.

6.1.3 Volume-price cap

Balancing the need for flexibility with budgetary constraints

Introducing a fixed price per APR-DRG (tariff cap) within a closed-end macro budget will not resolve the ongoing 'race' among hospitals to maximise their share of the national budget (cf. France). On the other hand, the main drawback of a hard volume cap as in Lombardy is that it can create an incentive to limit or avoid necessary care once the cap is reached, potentially compromising patient access and quality of care. To provide hospitals with more budget predictability, the payment system will need some flexibility. With a volume-price cap, hospitals can continue to provide care beyond the volume cap but are discouraged to do so as they receive a lower DRG tariff. However, under such system expenses are not fully predicable to the payers. Small hospitals might also be disadvantaged if the volume-cap that applies to them is not sufficient to cover fixed costs. Large hospitals might still get marginal benefits from activity above the target, albeit at a reduced price, while the reduced tariff might not be sufficient for small hospitals to cover their fixed costs. A potential consequence of this control mechanism could therefore be a further development towards larger hospitals. However, if such is undesirable in certain geographical areas (e.g. rural regions where accessibility could be compromised), policy makers might choose to exempt smaller hospitals from the DRG system. According to stakeholders, this situation – where small hospitals are necessary to ensure geographic accessibility – remains an exception in Belgium.

Preferred option for Belgian experts and stakeholders

Belgian experts and stakeholders prefer a volume-price cap as the control mechanism to manage case volumes if a DRG-based payment system per case is implemented. Careful design is essential to prevent compromises in care quality and hospital financial stability. Key considerations include the level at which the cap is applied (national, regional, or hospital) and whether



accountability for exceeding the volume limit is collective or individual. Also here it is important to note that the further down the hierarchy control mechanisms are applied (national level → hospital network → individual hospital → medical discipline), the greater the complexity introduced into the system's management, which could jeopardise the feasibility of such mechanisms.

In addition, it should be noted that the negative consequences of control mechanisms are lower when the caps are taking into account demographic evolutions and the accompanying (hospital capacity) needs of the population.

A volume-price cap relies on an effective budgeting mechanism. If budgets are set too late, the effectiveness of the mechanism risks to be undermined.

6.2 Design elements of the DRG-based hospital payment model per case can influence the impact of control mechanisms

In Chapter 3, we described the DRG-based hospital payment system in five countries. Although the main purpose of the country reports was to learn from the experience with mechanisms to keep the macro budget for hospitals under control, specific design features of a DRG-based hospital payment system were also included because they can make an important contribution to understanding the rationale and design of the control mechanisms.

Lessons learned from the design options of DRG-based hospital payments per case

A first design feature concerns the number of DRG groups. In the five studied countries, the number varies from 538 to 2 600. As was mentioned before, the number also depends on whether subgroups are defined. Cases belonging to a particular DRG are characterised by a homogenous resource consumption pattern and, at the same time, DRGs are clinically meaningful. A balance needs to be found between a sufficient number to guarantee fair treatment of hospitals and the risk of a complex system. A large number of

DRGs can lead to more precise payments, but adds to the (administrative) complexity of the system and raises questions about the statistical validity of costs per DRG (for instance, in France). It also increases the potential for gaming. However, there appears to be no correlation between the number of DRG groups and the chosen control mechanism.

The exclusions from DRG-based payments per case are more important in determining the choice of control mechanism. If certain costs, such as the costs of high-cost drugs or complex cases, are excluded from the DRG payments, hospitals may have more flexibility to exceed volume caps for those excluded services without facing financial penalties. This can lead to a situation where hospitals focus on treating cases that fall outside of the DRG system to avoid volume restrictions, which can make it difficult to control overall spending effectively. In a system with a hard budget cap and tariff reductions, excluding certain high-cost services from the DRG payment system may lead to tariff caps being applied more strictly to the remaining services covered by DRG payments as a way to control overall hospital costs. Exclusions allow more flexibility for hospitals, but they can also create challenges in managing overall healthcare costs within a capped system. In Belgium, it is yet to be precisely decided what type of costs will be covered by the DRG payment, and what types will be excluded.

Another key design element is whether physician fees are included within or separate from the DRG system. When physician fees are outside the DRG system, it can affect the effectiveness of control mechanisms. For example, if physicians are paid on a fee-for-service basis, they may have less incentives to limit admissions, in contrast to hospital management, which is constrained by control mechanisms. This misalignment can create tension between hospital management and physicians, as physicians make admission decisions while hospital managers bear the financial consequences. The minister's reform plans suggest moving toward a professional fee for physicians, which would incorporate part of the fees currently used to cover hospital costs (through deductions for practice costs) into the DRG system. This approach could help reduce tensions between physicians and hospital management by eliminating the need for frequent and often contentious negotiations over deductions. However, it will still be essential to involve physicians in hospital governance. To this end, the KCE



recommended in 2014 the creation of a quality and investment fund, jointly managed by hospital management and physicians.¹⁴

Another design element to consider is expanding the DRG system to include activities beyond hospital care. In several countries, there is a shift toward episode-based financing, also known as bundled payments, where a single tariff covers not only the costs of a hospital stay but also the pre-admission process (e.g. consultations with the surgeon and anaesthesiologist) and post-discharge care (e.g. follow-up consultations or aftercare). Bundled payments are especially suited for care that can be standardised. Integrating these payments further reduces the financial risk for the payer but increases the financial risk for hospitals when control mechanisms are applied.

The inclusion or exclusion of day-care activities alongside inpatient care in the DRG system impacts the effectiveness of control mechanisms. If day cases are not part of the DRG system, hospitals may shift patients to day hospital admissions once the inpatient payment cap is reached. While this may be medically justified, it could lead to increased overall expenditures at the macro level if no other control mechanisms are in place. However, in most countries, day cases are included in the DRG system to encourage their use. Various incentives support this approach, such as in France, where similar tariffs are applied to both inpatient and day cases for several DRGs. An accurate pricing per DRG is crucial to create incentives for increased day hospital use. This could involve setting a tariff that is slightly too low for an average inpatient stay and slightly too high for an average day case. However, this is just one of the possible mechanisms that could be considered.

6.3 How well do DRG-based payments per case achieve their goals?

Empirical evidence is moderately positive

The DRG system aims to control costs, enhance efficiency, and promote standardised, quality care. In the five countries studied, DRGs were implemented with these objectives in mind. Alongside advancing broader societal goals, DRG-based hospital payment systems per case were also introduced to increase transparency and promote fair treatment of hospitals. Improving hospital efficiency was a shared policy goal across all five countries, pursued either by linking payments to hospital activity rather than relying on global budgets or by replacing fee-for-service and per diem payment models. The umbrella review in Chapter 4 concludes that the vast majority of reviews confirmed that the implementation of DRG-based payment systems leads to a reduction in hospital length of stay. Also in the five studied countries, the length of stay decreased after the introduction of DRGs. However, in Germany, empirical evidence suggests that the average LOS has decreased, but not as sharply as before DRGs were introduced.

Findings on the impact of DRG-based payments on the volume of activity in the umbrella review were inconclusive. Whether this is due to appropriate control mechanisms was not analysed in the included reviews.

The available evidence does not support concerns about the potential adverse effects on quality of care or volume of services. Of course, the impact of the payment system cannot be isolated from the impact of other policy measures that were taken to guarantee quality or of mechanisms to control an increase in the number of cases.

But payment reforms abroad emerge to compensate for shortcomings of DRG-based payments per case

The evaluation of the merits of DRG-based payments per case, just like any other payment system, depends on the health policy objectives one wants to achieve with DRGs. However, no single payment method can meet all objectives perfectly. Since a large portion of hospital costs, such as salaries, are fixed, a DRG-based payment system per case is unlikely to drastically



reduce overall costs. On average, staff costs account for 60-70% of overall health spending.³² In Belgium for example, most salaries are automatically adjusted based on a complex indexation system taking into account inflation which protects workers from eroding real wages. Health providers and facilities may find it difficult to offset wage growth if service delivery prices remain inflexible.

A DRG-based payment system per case can improve efficiency by incentivising shorter stays and appropriate resource use. Significant cost reductions would require addressing fixed costs through broader structural changes, such as hospital consolidation.

All five countries introduced reforms, with various approaches for the transition away from DRG-based payments per case. Germany started with the largest share of DRG payments, but has since moved the most towards a global budget. Most countries implement more targeted interventions, primarily aimed at replacing inpatient care with day cases or outpatient care or moving in the direction of episode-based financing.^{33, 34} Episode-based financing has the potential to improve healthcare efficiency, reduce costs, and enhance coordination across care providers. However, the effectiveness of this model depends on careful implementation, clear definitions of care episodes, proper risk adjustment, and strong safeguards to maintain the quality of care. The evidence supports its use for certain conditions but highlights the need for balanced incentives to prevent adverse effects on patient outcomes.

The growing importance of day surgery as a cost-effective alternative to inpatient care is evident globally, with an increasing trend across Europe. However, this growth has been uneven across countries, and day surgery rates may still be underutilised. Payment systems play a crucial role in influencing how providers deliver care and can serve as a policy tool to promote more day surgeries. A review of strategies in 13 OECD countries found that all countries aim to boost day surgery to improve health system efficiency. Financial and non-financial measures were used to address incentive misalignments and promote day surgery. The research suggests that financial incentives can effectively encourage day surgery, but these should be part of a broader health system restructuring. The study also

recommends monitoring and evaluating the impact of payment system changes on day surgeries to enable more informed policy decisions.³⁵

6.4 Preconditions that contribute to the success of a DRG-based payment per case

In KCE report 207 some lessons learned from the design options of DRG-based payment systems (five countries) were highlighted.⁴ Also in Bredenkamp et al. (2020), a publication from the World Bank Group, the lessons learned from nine case studies are presented.³⁶ These countries include first adopters of DRG payments (for instance, the US and Australia), mature systems (such as Germany) as well as countries where DRG payments were introduced only in the past decade (for example, China). The lessons learned cover a broad range of topics: the purpose of the introduction of DRG payments, the classification system, the number of groups, the calculation of the cost weights and base rate, scope of DRGs and exclusions, control mechanisms, impact of DRGs, etc.

Most relevant for this report, are lessons learned in tariff setting, payment scope and control mechanisms.

Accurate tariff setting vital for a balance between cost control and quality care

DRG systems allocate payments based on the average cost of treating patients in specific diagnostic categories, aiming to encourage efficiency without compromising care quality. If the tariffs are too high, hospitals may receive excessive funds, reducing the incentive to minimise costs. If they are too low, hospitals may struggle to cover costs, potentially reducing necessary services or discharge patients prematurely, which may harm patient outcomes. Hospitals vary in their cost structures, and some may face higher-than-average costs for specific DRGs due to factors like geography, patient demographics, or specialised equipment. Accurate tariffs account for these factors, ensuring that all hospitals, including those in high-cost areas, receive fair compensation for the services provided, improving overall financial sustainability. Accurate tariffs should reflect good practices, stimulating efficiency but also ensuring that innovation is not blocked.



Governments and health insurers use DRG-based payments to incentivise specific health outcomes or operational goals, such as reducing hospital stays or preventing readmissions. Accurately set tariffs aligned with these policy goals ensure that financial incentives encourage hospitals to pursue outcomes in line with national health priorities, such as improved patient recovery times and optimised resource use.

The experience of the studied countries demonstrates that setting accurate tariffs is more challenging than it appears. Accurate tariff setting relies on high-quality, standardised cost data. While countries use activity-based costing or gather detailed cost data from (a sample of) hospitals, DRG tariffs seldom match actual costs. Instead, these tariffs are often influenced by budget constraints or national health priorities. Tariffs rarely cover the full cost of providing care.

Accurate tariff setting also relies on the representativeness of the hospitals that gather cost data. In France, for instance, tariff setting has faced criticism due to concerns over the reliability of the national cost study, which is questioned because of the small sample size and the limited representativeness of the participating hospitals. The large number of DRG tariffs also contributes to the lack of reliability of tariffs in France.

Some countries, like Germany, adjust the tariffs for local factors (the base rate in Germany is determined at the state level). Local factors can be hospital size, population density, and regional costs (for instance, wage costs).

Finally, accurate tariff setting also depends on the frequency of updates. In Italy, for example, the last update of the national DRG tariffs was done in 2012. Cost weights based on reliable data help align tariffs with actual service costs but require significant data management and ongoing updates.

Belgian experts and stakeholders also stressed the importance of aligning tariffs with actual costs to minimise incentives for selecting the most profitable DRGs. When a tariff cap is used as a control mechanism, it creates the greatest disconnection between costs and tariffs (for a given budget).

Scope of DRG payments is crucial for appropriate tariff setting and selecting the appropriate control mechanisms

The share of DRG payments in the studied countries ranges from about 30% to 80%. The share of DRG payments (the proportion of hospital costs covered by DRGs) and the scope of DRG payments (the types of cases included or excluded, such as high-cost or complex cases but also certain patient groups or hospital departments such as the emergency department) are interconnected in determining the financial risk distribution between the payer and provider, and effectiveness of cost control measures.

A higher share of DRG payments implies more healthcare services are paid through DRGs, increasing cost predictability but also potentially increasing financial pressure on providers if, for instance, complex cases are included. Conversely, a narrow scope (with many exclusions) shifts these unpredictable costs away from DRG payments to alternative reimbursement methods, protecting providers but adding financial risk to payers. Therefore, balancing the scope of DRG payments is crucial for maintaining both fiscal stability and equitable risk distribution between payers and providers.

Countries differ with regard to the degree of exclusions. For all exclusion mechanisms, a wide diversity of payment methods is applied in the five countries: FFS payments, per diem payments, global budgets, etc. Very limited information has been found on the rationale for the choice of payment method. In general, the rationale behind selecting specific payment methods for excluded services often depends on the goals of the healthcare system, the nature of the services excluded, and the need for financial predictability and cost control. Each method is chosen to meet specific cost and care needs that the DRG system alone may not address effectively.

In Estonia and France, investment costs are included in the DRG tariffs. In Germany, investment costs are separated from DRG tariffs. However, due to underinvestment in infrastructure, hospitals have been dependent on high activity levels and DRG reimbursement, or have had to delay necessary renovations. Also in Belgium, investment costs are the responsibility of regional authorities.



Belgian experts emphasised that setting the scope of DRG payments in Belgium is an important precondition for selecting the appropriate control mechanism. Volume caps might be more difficult to enforce if the scope of DRG payments is limited, as providers can focus on cases that fall outside of the DRG system once the cap is reached. Also, a tariff cap, with prices disconnected from costs, might be more acceptable if it only concerns a limited part of hospitals' activity. Complex hospital volume calculations are judged unnecessary when the DRG-based budget only relates to a small proportion of cases.

Volume-price cap

Chapter 5 and Appendix 2 provided a thorough discussion of the advantages, disadvantages, and prerequisites of various control mechanisms. Belgian experts and stakeholders favoured a volume-price cap, a system currently used in Estonia, Germany, and Hungary. The following prerequisites were identified as essential for implementing this approach in Belgium:

- A volume-price control should incorporate an assessment of needs by adjusting the volume threshold based on projected healthcare demand in a given region or population. If the need for services is expected to be higher (due to factors like population health, demographics, or regional healthcare access), the volume cap can be set higher to ensure adequate access, with controlled pricing beyond this limit. For example, if social care services are insufficient or poorly coordinated, patients may remain in hospital longer than medically necessary, waiting for social care arrangements such as rehabilitation or long-term care placements. Gaps in the social care system could lead to longer hospital stays, driving up costs and undermining the effectiveness of DRG-based payments. Periodic revisions allow hospitals to better meet community needs while maintaining cost control by adjusting both volume limits and price reductions in alignment with assessed healthcare demands.

- No clear specific preference was expressed regarding the level of application (national, regional, network, hospital) as each level comes with advantages and disadvantages. If the volume-price caps are implemented at the hospital network level, for instance, it could stimulate collaboration within the network on the condition that networks share financial resources. The disadvantage is that it is more complex to implement compared to volume-price caps at the national level.
- Mechanisms to prevent coding manipulation for financial gain (e.g. upcoding) are essential, along with penalties for hospitals that engage in such practices. Upcoding is a well-documented issue in DRG-based payment systems, driven by financial pressures and the complexity of coding criteria.³⁷ Robust auditing and regulatory mechanisms are necessary to reduce its prevalence.
- Sufficient resources should be foreseen for data collection, volume calculations, updates and audits.

Beyond tariffs, scope, and control mechanisms, other factors can significantly influence the effectiveness of a payment reform transitioning to DRG-based payments per case. Evidence suggests that for-profit hospitals are generally more responsive to financial incentives than public or not-for-profit hospitals.³⁸ However, this responsiveness can also lead to unintended consequences like gaming the system or focusing on high-revenue services while neglecting less profitable areas. Policymakers must consider these dynamics when designing DRG-based reforms to ensure fair and balanced incentives across hospital ownership types. In Belgium, for-profit hospitals are not permitted; all hospitals operate as either public institutions or private not-for-profit organisations.



6.5 Conclusion

The design elements of DRG-based hospital payment models significantly influence the effectiveness of control mechanisms, but broader considerations are needed to ensure these systems remain viable in the long term. Key features, such as the number of DRG groups, exclusions, and the inclusion of physician fees, shape financial incentives and operational efficiency. While a larger number of DRGs improves precision, it also increases administrative complexity and potential for gaming. Exclusions offer flexibility but can undermine cost control, underscoring the importance of balanced approaches tailored to evolving healthcare objectives. Accurate and frequently updated tariffs, informed by reliable cost data and aligned with national priorities, are crucial to maintaining fairness and sustainability.

Financial risk is crucial in DRG-based payments per case because it directly influences hospital behaviour. Financial risk makes hospitals more mindful of how resources are allocated. It drives them to prioritise treatments or services that are most cost-effective and reduce unnecessary or inefficient care. This is important for the sustainability of healthcare systems, especially in the face of rising healthcare costs. Financial risk-sharing mechanisms, such as payment caps or penalties, ensure that hospitals have a strong financial incentive to limit cost escalation. Without this risk, there would be less pressure to control expenditures, potentially leading to unsustainable increases in healthcare costs.

A crucial question is whether a DRG-based system per case will not only address current challenges but also adapt to future needs over the next 10–20 years. Increasing demographic pressures, such as aging populations and shifts in disease patterns (e.g. cancer as a chronic illness due to advanced therapies), alongside an international healthcare workforce crisis, demand payment models that can sustain and incentivise innovation. The post-COVID era highlights the urgent need for adaptable healthcare systems that address new demands, such as enhanced hospital resilience and robust responses to public health emergencies.

While DRG-payment systems can reduce inefficiencies and improve transparency, hospitals face risks, including financial pressures when dealing with high-cost or complex cases and the potential misalignment of incentives with quality care goals. Threats include increased administrative burdens, risks of coding manipulation, and challenges in ensuring equitable resource allocation. Future discussions must explore how DRG-payments per case can solve inefficiencies and inequities while mitigating these threats to ensure they remain fit for purpose in dynamic healthcare landscapes.

The literature review as well as the country reports show that the impact of a DRG-based payment per case is uncertain and should not be overstated. Therefore, transaction costs associated with implementing a new payment system should be carefully considered and integrated in the implementation plan of a new payment scheme. In addition, complementary reform measures outside the payment system are necessary to achieve the intended policy objectives.

Limitations of the study

A study on control mechanisms in countries with DRG-based payments per case may face several limitations. One major challenge is the contextual differences between countries, including variations in healthcare systems, economic conditions, and policy frameworks, which can limit the generalisability of the findings. Additionally, data availability can be a constraint, as inconsistent or limited data on the actual implementation and effectiveness of control mechanisms may impact the accuracy and depth of the conclusions. The complexity of control mechanisms, such as volume-price caps or tariff caps, also makes it difficult to isolate their effects or compare them directly across countries. Regulatory and institutional differences across countries can affect how control mechanisms are applied and their effectiveness, making cross-country comparisons more challenging. The absence of proper evaluation of the mechanisms within the considered countries also impedes drawing unequivocal conclusions. Moreover, the fact that only five countries are included in the study further limits its scope, reducing the ability to draw



broad conclusions applicable to other healthcare systems. Only a limited number of experts were consulted, which means that the insights gathered may not fully represent the diverse perspectives needed for a comprehensive understanding. These limitations can impact the study's ability to offer clear, actionable recommendations for the Belgian context.



■ APPENDICES

APPENDIX 1. APPENDIX TO CHAPTER 4

Table A. 1 – Search strategy: EconLit

Date	3 September 2024	
Database	Econlit <1886 to September 03, 2024>	
Search strategy		
1	prospective pricing.tw,hw.	5
2	prospective reimbursement?.tw,hw.	26
3	discretionary adjustment?.tw,hw.	12
4	prospective payment*.tw,hw.	236
5	reimbursement system?.tw,hw.	115
6	pps.tw,hw.	176
7	capitation.tw,hw.	288
8	(DRG or DRGs).tw,hw.	213
9	diagnosis related groups.tw,hw.	103
10	activity-based funding.tw,hw.	10
11	activity-based financing.tw,hw.	13
12	activity-based payment?.tw,hw.	9
13	ABF.tw,hw.	15
14	value-based reimbursement?.tw,hw.	6
15	reimbursement?.tw,hw.	1432
16	1 or 2 or 3 or 4 or 5 or 6 or 7 or 8 or 9 or 10 or 11 or 12 or 13 or 14 or 15	2199
17	((systematic review or systematic literature review or systematic scoping review or systematic narrative review or systematic qualitative review or systematic evidence review or systematic quantitative review or systematic meta-review or systematic	1066



	critical review or systematic mixed studies review or systematic mapping review or systematic cochrane review or "systematic search and review" or systematic integrative review).ti. not comment.pt. not (protocol or protocols).ti. not medline.st.) or (Cochrane Database Systematic Reviews.jn. and review.pt.) or systematic review.pt.	
18	health technology assessment.tw,hw.	179
19	HtA.tw,hw.	118
20	meta-analys*.tw,hw.	1977
21	17 or 18 or 19 or 20	3159
22	16 and 21	46

Table A. 2 – Search strategy: MEDLINE

Date	29 August 2024	
Database	Ovid MEDLINE(R) Epub Ahead of Print and In-Process, In-Data-Review & Other Non-Indexed Citations and Daily <1946 to August 29, 2024>	
Search strategy		
1	exp Prospective Payment System/	15439
2	prospective pricing.ab,ti,kf.	138
3	prospective reimbursement?.ab,ti,kf.	202
4	discretionary adjustment?.ab,ti,kf.	1
5	prospective payment*.ti,ab,kf.	2546
6	reimbursement system?.ab,ti,kf.	1388
7	pps.ti,ab,kf.	8429
8	capitation.ti,ab,kf.	2661
9	(DRG or DRGs).ab,ti,kf.	17984
10	diagnosis related groups.ab,ti,kf.	2421
11	activity-based funding.ab,ti,kf.	114
12	activity-based financing.ab,ti,kf.	26



13	activity-based payment?.ab,ti,kf.	25
14	ABF.ab,ti,kf.	916
15	value-based reimbursement?.ab,ti,kf.	199
16	reimbursement?.ti,kf.	7680
17	2 or 3 or 4 or 5 or 6 or 7 or 8 or 9 or 10 or 11 or 12 or 13 or 14 or 15 or 16	40375
18	1 or 17	49336
19	exp Hospitals/	329097
20	Hospitalization/	142343
21	Inpatients/	31521
22	Secondary Care/	1053
23	Tertiary Healthcare/	1994
24	19 or 20 or 21 or 22 or 23	478785
25	hospital*.ab,ti,kf.	1758672
26	inpatient*.ab,ti,kf.	150921
27	provider.ab,ti,kf.	86148
28	acute care.ab,ti,kf.	30266
29	secondary care.ab,ti,kf.	9411
30	tertiary care.ab,ti,kf.	71854
31	patient care.ab,ti,kf.	91223
32	25 or 26 or 27 or 28 or 29 or 30 or 31	1994762
33	24 or 32	2118867
34	18 and 33	14770
35	Quality of health care/	78530
36	Quality Indicators, Health Care/	17783
37	Outcome Assessment, Health Care/	83659



38	"Outcome and Process Assessment, Health Care"/	28629
39	Patient Satisfaction/	91867
40	Patient Readmission/	24156
41	treatment outcome/	1205644
42	Postoperative Complications/	412566
43	exp intraoperative complications/	57999
44	exp Mortality/	431452
45	Patient Discharge/	42061
46	"Length of Stay"/	106357
47	Efficiency/	15944
48	efficiency, organizational/	22562
49	35 or 36 or 37 or 38 or 39 or 40 or 41 or 42 or 43 or 44 or 45 or 46 or 47 or 48	2268331
50	quality indicator*.ab,ti,kf.	12271
51	quality outcome.ab,ti,kf.	442
52	complication rate*.ab,ti,kf.	74513
53	complications.ab,ti,kf.	1030309
54	readmission.ab,ti,kf.	36683
55	mortalit*.ab,ti,kf.	1073589
56	indicator?.ti,kf.	63084
57	impact?.ti,kf.	399927
58	effects.ti,kf.	1162731
59	length of stay.ab,ti,kf.	86950
60	efficiency.ab,ti,kf.	652612
61	discharge?.ab,ti,kf.	359881
62	satisfaction.ab,ti,kf.	199642



63	50 or 51 or 52 or 53 or 54 or 55 or 56 or 57 or 58 or 59 or 60 or 61 or 62	4555712
64	49 or 63	6016129
65	exp "Costs and Cost Analysis"/	272749
66	cost?.ab,ti,kf.	785239
67	expenditure?.ab,ti,kf.	73843
68	affordability.ab,ti,kf.	8957
69	(price? or pricing).ab,ti,kf.	57497
70	66 or 67 or 68 or 69	878067
71	65 or 70	982255
72	64 or 71	6701701
73	34 and 72	10901
74	((systematic review or systematic literature review or systematic scoping review or systematic narrative review or systematic qualitative review or systematic evidence review or systematic quantitative review or systematic meta-review or systematic critical review or systematic mixed studies review or systematic mapping review or systematic cochrane review or "systematic search and review" or systematic integrative review).ti. not comment.pt. not (protocol or protocols).ti. not medline.st.) or (Cochrane Database Syst Rev.ja. and review.pt.) or systematic review.pt.	321891
75	meta-analys*.ti.	210130
76	meta-analysis.pt.	207063
77	exp Technology Assessment, Biomedical/	12442
78	health technology assessment.ti,kf.	3116
79	HtA.ti,kf.	946
80	74 or 75 or 76 or 77 or 78 or 79	452831
81	73 and 80	122
82	("37083281" or "36913795" or "32001043" or "38492098" or "38710538" or "25803858" or "25347697").ui.	7
83	81 and 82	7


Table A. 3 – Summary of systematic reviews with details about the number and type of included studies, setting and databases searched

Study	Sources searched	Years searched	N. and type of studies	Risk of Bias	Countries included in the review	Population	Intervention and comparator	Outcomes
Argarwal et al. (2020)²⁷ [restricted to ACE]	MEDLINE and the Cochrane Central Register of Controlled Trials	Inception to February 2019	2 studies*: 1 CBA study and 1 pre/post study	n/a	USA (2)*	Not specified	I: Bundled payment approach C: Fee-for-service reimbursement	Health care spending (total episode spending, episode spending for inpatient and post-acute care stays, and home health agency spending in the episode); utilization (discharge disposition and length-of-stay in the hospital and post-acute care facilities); quality (readmission rate, complication rate, mortality, and emergency department visits); unintended consequences (differences in risk selection or case complexity and episode volume).
Barouni et al. (2021)²³	Scopus, PubMed, and Excerpta Medica Database (EMBASE)	From 1983 to July 10, 2018	21 studies: 15 CBA studies; 5 cohort studies; 1 RCT	The standard evaluation checklist of Kmet et al. (2004) was used with a max. score of 18. All articles had a score of at least 90%.	USA (10), Switzerland (4), Italy (2), Korea (2), Germany (1), Japan (1) and Taiwan (1)	Not specified	I: The implementation of the reimbursement mechanism based on DRG C: Not explicitly mentioned	Quality, efficiency, and capacity utilization



Study	Sources searched	Years searched	N. and type of studies	Risk of Bias	Countries included in the review	Population	Intervention and comparator	Outcomes
Brown et al. (2022)²² [restricted to prospective payment models in hospitals]	Ovid MEDLINE, Embase, Scopus, Cumulative Index to Nursing and Allied Health Literature (Ebsco), and PAIS Index (ProQuest)	Inception to February 11, 2020	4 studies*: 2 cross-section studies; 1 pre/post study, 1 CBA study	Quality was appraised using the Newcastle-Ottawa Quality Assessment with modified criteria for both cohort and cross-sectional studies. Studies were rated on a total scale score of 0 to 9 for selection (4 possible points), comparability (2 points), and outcome (3 points). Studies were considered high quality if they received at least 7 total points and at least one point in each of the 3 categories. Score 8 (2), score 7 (2)*	USA (2); Italy (2)*	Haemorrhagic or ischemic stroke; TIA plus stroke	I: Alternative Payment Models C: Fee-for-service payment models	Outcome specific to haemorrhagic or ischemic stroke in one of three categories: clinical outcomes (e.g. in-hospital mortality, all-cause or stroke specific mortality, readmissions, recurrent stroke, functional outcomes, clinical quality, patient satisfaction), health care utilization (e.g. acute admission length of stay, post-acute care utilization, days in community, medical services, specialty care), or spending (i.e. spending for total stroke episode, inpatient admission, post-acute care, shared savings, or losses).
Chen et al. (2023)²⁴	PubMed, EMBASE, Web of Science, Cochrane Central, NHS Economic Evaluation, Global Health and Health Policy Reference Center	Inception to December 30, 2022	29 studies: 15 cohort studies, 9 CBA studies; 5 pre/post studies	Cohort studies: overall risk of bias is scored on a scale of 0 to 9 (score <6 is low quality): score 6 (2), score 7 (5), score 8 (8). CBA studies: 9 with overall high risk of bias; pre/post studies: overall risk of bias is low (3), unclear (1) or high (1).	USA (8); South-Korea (7); China (5); Switzerland (4); Taiwan (2); Australia; France	Inpatients of all genders and age groups, with all kinds of diseases, with no restriction on type of clinical procedure	I: DRG-based payment systems based on DRGs or other similar patient classification C: Cost-based payment system: - retrospective payment; - cost-based reimbursement; - per service as the unit of payment	Quality of health care (including 30-day re-admissions, in-hospital mortality, 30-day-mortality, etc.) and efficiency (e.g. LOS)



Study	Sources searched	Years searched	N. and type of studies	Risk of Bias	Countries included in the review	Population	Intervention and comparator	Outcomes
Lino et al. (2023)²⁰	PubMed, Embase, Web of Science and Google Scholar	2012-2022	6 cohort studies	The risk of bias in included studies was evaluated using the ROBINS-I tool (Risk Of Bias In Non-randomized Studies-of Interventions). Overall risk of bias: moderate (4) or serious (2)	Korea (5) and China (1)	Patients submitted to appendectomy	I: Payment grouped by diagnosis / Bundled Payment for Care Improvement payment model C: Fee-for-service payment model	Effectiveness of the payment model considering complications, costs and LOS
Meng et al. (2020)²⁵	Medline, Embase, Cochrane Central Register of Controlled Trials, ISI Web of Science, NHS Economic Evaluation, EconLit with Full Text, Global Health and Health Policy Reference Center	Inception to October 2018	18 studies: 13 CBA studies; 5 pre/post studies	Criteria recommended by EPOC were used to assess the risk of bias, and an overall assessment of the risk of bias was assigned to each study included: high (14), unclear or low (4) CBA studies: 13 with high risk of bias for inadequate allocation sequence and allocation concealment; pre/post studies: 1 study with high risk of bias that outcomes maybe affected by another policy.	USA (7); Taiwan (4); Mainland China (3); UK (1), Australia (1), France (1), Korea (1)	Hospitalised patients	I: DRGs-based payment: - prospective payment; -paid a fixed amount except for outlier payments; - per case as the unit of payment based on a specified diagnosis C: Cost-based payment: - retrospective payment; - cost-based reimbursement of hospitals; - per service as the unit of payment	LOS (proxy for efficiency), total inpatient spending per admission (proxy for unit costs for inpatient care) and readmission rates (measure of inpatient healthcare utilisation, because readmissions are associated with increased hospital costs)
Palmer et al. (2014)²⁶	OVID MEDLINE, EMBASE, OVID Healthstar, CINAHL, Cochrane Central Register of Controlled Trials (CENTRAL),	1980-2012	65 studies: 36 pooled studies (34 pre/post; 2 cohort) and 29 non-pooled studies (25	n/a	USA (50); Italy (4); Australia (3); Germany (2); Switzerland (2); Austria (1); England (1); Israel (1);	Patients in acute care settings (hospitals and non-hospital medical or surgical facilities)	I: Activity-based funding (based on DRG-like grouping algorithms) C: Alternative funding systems	Acute care mortality, post-acute care mortality, readmission rates, and discharge destination. For eligible studies that reported at least one of the primary outcomes severity of illness and volume of care are also considered.



Study	Sources searched	Years searched	N. and type of studies	Risk of Bias	Countries included in the review	Population	Intervention and comparator	Outcomes
	Health Technology Assessment, NHS Economic Evaluation Database, Cochrane Database of Systematic Reviews, and Business Source Complete		pre/post; 1 cohort; 3 CBA)		Scotland (1); Sweden (1)			
Pott et al. (2023)¹⁹	PubMed, EconLit and Web of Science	1983 to October 2020	64 studies: 38 pre/post studies; 22 CBA studies, 3 cohort studies and 1 undetermined	All included studies were critically appraised for their risk of bias and overall quality by using a critical appraisal checklist based on Joanna Briggs Institute (JBI) tools. High quality (10), moderate quality (18), or low quality (36)	USA (36); China (5); Republic of Korea (4); Italia (4); Taiwan (3); Sweden (2); Japan (2); Germany (2); Switzerland (1); Israel (1); France (1); Canada (1); Austria (1); multiple countries (1)	Human subjects; any age; all ethnicities; all geographical areas	I: Introduction of a PPS or price change in a PPS C: Inpatients treated under different PPS or under alternate system	Health status; symptom relief; satisfaction; enablement; discharge destination
Zhao et al. (2024)²¹ [restricted]	PubMed, MEDLINE (Ovid), Embase, and Cochrane Central Register of Controlled Trials.	Inception to December 2023	4 pre/post studies*	The risk of bias in included studies was evaluated using the ROBINS-I tool (Risk Of Bias In Non-randomized Studies—of Interventions). Overall risk of bias: low (1), moderate (2) or serious (1)*	USA (1); Taiwan (1); Israel (1); Ireland (1)*	Inpatients of any gender and age undergoing cholecystectomy	I: Prospective payment reforms implemented at the hospital level or as part of national/state health initiatives, including both pilot and expanded programs C: Traditional payment methods used before the implementation of PPS	Primary outcomes: LOS and mortality rates (defined as death within 30 or 90 days after cholecystectomy or in-hospital mortality). Secondary outcomes: complications, admissions, readmissions, hospital costs, and financial margins.

* Only selected studies are described. CBA = controlled before-after; EPOC = Cochrane Effective Practice and Organisation of Care Group



APPENDIX 2. APPENDIX TO CHAPTER 6

In this appendix we describe the advantages, disadvantages and preconditions as listed by the consulted experts (via post-its or oral intervention during the expert panel). We describe these per type of control mechanism.

Appendix 2.1. Tariff cap: advantages, disadvantages and preconditions

Appendix 2.1.1. Advantages

- **General**
 - The tariff cap allows hospitals some financial flexibility, ensuring that they are paid for the services they provide, even if the macro-level budget is exceeded (be it at reduced amount). Unlike volume caps, there is no restriction on the number of hospital admissions, allowing hospitals to manage their activity based on demand.
 - When the tariff is correct and the projections about volume are correct (preconditions), surpassing the macro-level budget is not appropriate and then financial penalisation is justified. Yet, this is of course theory.
- **National level**
 - A linear adjustment of tariffs carries low risk for public authorities, as it is a way to control the macro-level expenditure.
 - Freedom of activity: Hospitals can continue to provide a broad range of services without volume limits, incentivising hospitals and physicians to specialise in fields where local demand is high.
 - No waiting lists: Without a cap on the number of admissions, hospitals can meet patient demand without long delays (on the condition that capacity needs, including required staff, can be met).

- Efficiency incentive: Reducing prices as volume increases incentivises hospitals to manage costs more efficiently, encouraging innovation and reducing expenses.
- Alignment with Belgian system: This mechanism fits within the Belgian healthcare framework, in the sense that currently (medico-mut agreements) already tariff adjustments are applied by medical specialty to keep the budget in balance. Yet, it is also in line with the current closed-ended hospital budget. The value of a point decreases when the volume of activity increased the previous year. To increase the benefits of such a mechanism, the tariff reduction could be applied by medical specialty (e.g. orthopaedics). Another precondition is that the costs per DRG are known and that the growth norm is kept.

- **Hospital network level**

- In theory, a tariff cap could encourage cooperation within hospital networks if they work with a shared budget. However, this would be a long-term goal requiring significant system changes.

Appendix 2.1.2. Disadvantages

- **General**
 - Uncertainty regarding the tariff due to adjustments when the macro-level budget is exceeded.
 - The system is complex and requires regular recalibration.
 - There is a disconnection between the (appropriate) costs and tariffs.
 - A linear tariff reduction is not fair and should be avoided. The alternative, a targeted tariff reduction (per hospital, medical specialty, etc.) is unfeasible.
 - There is a risk that the correction mechanism during budget overruns is inappropriate, especially with linear adjustments. For instance, hospitals with a justified increase in their activity because of an increased need of the population in their catchment area



might be penalised by the inappropriate increase in hospital admissions by other hospitals.

- Service selection prioritised on how financial rewarding they are: If the tariff reductions are applied per DRG, it is possible that hospitals prioritise DRGs that are more financial rewarding, potentially neglecting necessary but less financial rewarding services.

- **National level**

- Peloton effect: Hospitals may increase activity during a given year, leading to a significant drop in tariffs the following year, encouraging unsustainable competition. The same argument that holds for the system of justified activities in the current BFM system (LOS reduction).
- There is no individual accountability but an control at the sector level. Price reductions would affect all hospitals, even those that did not increase activity, placing the entire sector under financial strain.
- Volume pressures: Hospitals might boost activity, particularly for elective procedures, leading to unnecessary care provision.
- Quality of care risks: As prices fall, hospitals might cut corners on quality or services for financial reasons.
- If the increases in volume are appropriate, the tariff will still be reduced. It is possible that the patient will suffer the consequences (e.g. increase in patient supplementary payments to compensate financial loss).
- There is still an incentive to produce and thus the negative consequences of exaggerated competition between hospitals (even within the same network) will continue to exist.
- Smaller hospitals might feel a greater financial strain, as the price cap would apply regardless of the variations in their service delivery.

- **Regional level**

- Regional inequality: Differences in tariffs between regions could lead to disparities in access and quality of care.
- It would in the facts result in a reform of the state.
- The healthcare needs differ per region: If the correction mechanisms do not take these different needs into account a penalisation of excessive spending at the regional level is unfair.
- Pressure on regional budgets: Regions may face pressure to cover healthcare shortfalls, pushing for changes in taxes or social security funding.

- **Hospital network level**

- A tariff cap could intensify competition between and within hospital networks, making collaboration even more challenging.

- **Hospital level**

- Applying this at the level of the hospital is infeasible since it would require 100 different tariffs per DRG (1 per hospital);
- Hospitals could focus too much on cost-cutting rather than quality improvement.

Appendix 2.1.3. Preconditions

- **General**

- Accurate DRG pricing is key to aligning tariffs with real costs, reducing incentives to select only the most profitable DRGs.
- Growth norms should be maintained to account for changing demand in hospitals' catchment areas.
- A posteriori control mechanisms should monitor volume growth to prevent hospitals from exceeding budgets unjustifiably.
- Quality control is needed to ensure that hospitals do not reduce the quality of care when faced with price reductions.



- Instead of automatic penalties, a review committee of experts could assess whether hospitals have provided appropriate care, with sanctions applied only for inappropriate care.
- Price adjustments: It is important to regularly update the prices to ensure they reflect actual costs and to avoid outdated pricing systems.
- A linear price adjustment can create a negative cycle reminiscent of the previous points system. 'Smart' price adjustments (taking into account population needs of the catchment area of the hospital) are needed, but the method is unclear.
- Costs of a hospital stay could be adjusted if reduced (for example via innovation), essentially requiring regular price updates.
- Tariff setting should be done at the national level, allowing hospitals to retain autonomy in their operations.
- There need to be control mechanisms to penalise excessive and inappropriate surpassing of the budget. This can only be applied when there is a system that takes into account the changing (growing) demand of the catchment area of the hospital. It is probably better to penalise on the 'inappropriate' character of care than on volume or price. 'What is value-based'? What is not? This can be defined by a committee of experts rather than by an arithmetic algorithm.

Appendix 2.2. Volume cap: advantages, disadvantages and preconditions

Appendix 2.2.1. Advantages

• General

- Predictability and financial stability: A well-defined volume cap offers hospitals clear expectations, enabling financial stability and predictability. Hospitals can plan activities without concern for unpredictable budget shifts. The tariff is no longer reduced based on the activity of others and is known in advance. So it is more predictable for hospitals (as long as the volume thresholds take into account the population needs).
- Encouragement of day and outpatient services: Volume caps may drive hospitals to increase the use of day hospital and outpatient services, promoting efficiency and lowering costs.
- Prevention of unjustified excess in hospital admissions: When volume limits are well-calculated based on patient needs, exceeding the limit may indicate unnecessary activity, justifying the decision to withhold funding beyond the cap. So, it could be considered as a policy instrument to reduce inappropriate activity.
- Reduced competition: By limiting activity, volume caps reduce competition between hospitals, as there are no financial incentives to increase admissions beyond the cap. This may reduce the pressure for hospitals to engage in 'competitive behaviour.' As long as the money follows the patient, there will be competition. If you want to take away a driver of such competition, the volume cap is an option.
- Geographic control: A volume cap applied to a regional level smaller than Flanders/Brussels/Wallonia but larger than individual hospital networks could help address practice variations (e.g. in procedures like hip replacements) between hospitals. However, this is more difficult to manage for other types of treatments.



- **Network level**

- Stabilising competition: Volume caps may help reduce unhealthy competition between hospital networks by setting a limit on activity, fostering a more collaborative approach in managing patients and resources.
- Volume caps at the level of a regional entity (between the region and local networks) could help in the standardisation of practices and promote better resource management.

Appendix 2.2.2. Disadvantages

- **General**

- Private compensation mechanisms: Hospitals may try to bypass volume caps by shifting services outside the DRG system or into private care settings, potentially creating a two-tier healthcare system, where wealthier patients receive faster treatment, while others experience delays. Physicians may shift more of their activities to private practice once volume limits are reached, exacerbating the development of a dual public-private healthcare system.
- Innovation stagnation: Limiting the number of patients that hospitals can treat might reduce their incentive to invest in new technologies or innovative treatments. Physicians may also be less motivated to innovate if their fees are capped.
- Coding manipulation: Hospitals might engage in up-coding (e.g. classifying cases as more severe when the volume-cap in these classes is not yet reached and vice versa) to maximise financing within volume limits. This increases the burden of auditing and control.
- Waiting lists and delays: Hospitals may delay non-urgent treatments until the following year when the volume cap occurs, leading to artificial delays in care delivery and longer waiting lists. Patients could face long waiting lists once the cap is reached, possibly being referred to distant hospitals (when volume caps are

applied at the level of hospital networks or hospitals), which would burden them with additional travel time.

- Inflexibility in case of public health demands: Volume caps are not well-suited to sudden increases in demand, such as during public health emergencies (e.g. COVID-19). In these cases, exceeding the cap is unavoidable, yet the system could limit hospitals' capacity to respond.
- Unclear mechanisms for reducing inappropriate admissions: There is no clear method to determine how to effectively limit unnecessary admissions within the cap.
- It is stressed that volume limitations should focus on inappropriate admissions. However, while it is argued that a nuanced, smart approach is needed, potentially combining volume and price controls for more effective outcomes is required.
- Paradigm shift compared with the current system: you are no longer necessarily paid for what you do.
- Hospitals are penalised for excessive activity while physicians determine if a patient is admitted (requires similar incentives for the physician payment).
- Are volume-caps ethical?

- **National level**

- Complexity and infeasibility: Implementing volume caps at the national level would likely fail to address the regional and local nuances of healthcare needs.
- Basic accessibility concerns: Once the national volume is reached, questions arise about who should get care and how to distribute resources. This could hinder access to healthcare.



- **Regional level**

- Ethical and methodological challenges: Implementing volume caps at the regional level raises questions about equity. It may lead to unfair patient selection based on the cap rather than medical need.

- **Hospital level**

- Administrative complexity: Setting appropriate volume caps for each hospital is administratively burdensome, requiring detailed calculations based on historical data, projected needs, and population growth.
- Contradiction with other policies: Volume caps may conflict with policies aimed at increasing hospital activity to improve quality (e.g. the 'practice makes perfect' principle).
- Productivity disincentives: Hospitals may avoid investing in new technologies or expanding services because additional activity would not be compensated once the cap is reached.
- Not possible for public authorities to calculate a volume per hospital (certainly not when it has to concern an appropriate volume based on population characteristics of the catchment area of the hospital). This would require too much capacity (analysts, etc.).

Appendix 2.2.3. Preconditions

- **General**

- Adaptation to population characteristics: It is emphasised that volume caps must account for regional morbidity factors (e.g. diabetes or obesity) to ensure fairness. This would be particularly important for lower-level entities than the national system.
- Accurate volume allocation: Volume caps must be fairly and accurately set, taking into account historical activity, patient needs, and demographic data. Negotiations will be key to determining appropriate levels.

- If the price is lower than the cost then there is an incentive to produce less and vice versa. So, it depends on the price setting how large the need will be to set volume caps.
- A pro-active policy is required, no post-hoc corrections
- Auditing and oversight: Increased resources for coding audits and regulatory oversight will be needed to prevent system manipulation (e.g. up-coding or delaying services).
- Flexible mechanisms for demand surges: Provisions must be in place to allow for temporary adjustments to volume caps in case of unexpected demand surges, such as during public health crises.
- Mitigating shifts to private care: Policies must address the risk of services shifting to private practice once public volume limits are reached. This could involve tighter regulation of private practices or incentives to retain services in the public system.
- Patient access considerations: Safeguards should be in place to prevent disparities in access, especially for remote populations, ensuring they are not disadvantaged when their local hospitals reach the volume cap.
- A way to check if hospital admissions are appropriate are the AEP (Appropriate Evaluation Protocols). This method could help to critically assess whether volumes are appropriate and not inflated by unnecessary admissions.
- Imposing a volume cap per patient type is unrealistic unless the country is organised in geographical areas (NHS – like), which is not the case in Belgium. Moreover, tertiary care and academic hospitals have a larger catchment area. For these type of hospitals other volume calculation rules should apply.
- The clinical judgment of the individual physician if a hospital admission is appropriate is a principle that needs to be maintained.



- **Hospital level**

- The tariff for hospitals should be known in advance and independent of the activity of other hospitals. It should be simple, equitable, and plannable, potentially using an all-in fee per hospital stay (including both inpatient and day hospital services) to encourage shorter stays.

Appendix 2.3. Volume-price cap: advantages, disadvantages and preconditions

Appendix 2.3.1. Advantages

- **General**

- Comfortable for payers: Volume-price caps allow payers to manage healthcare budgets more effectively by controlling both the quantity of services and their costs. This creates financial stability for government healthcare programmes while also maintaining accessibility of care.
- Encourages efficient care: By incentivising hospitals to limit inpatient admissions and focus on necessary care, this system promotes more outpatient and alternative care (e.g. transmurals, rehabilitation), which can be less expensive and more efficient.
- Incentivises innovation and prevention: Hospitals have financial motivations to explore innovative, cost-effective treatment options and focus on preventative care to avoid unnecessary admissions, especially when volume-caps are reached.
- Discourages unnecessary admissions: Financial penalties tied to exceeding volume caps encourage hospitals to avoid admitting patients unnecessarily and only provide essential services.

- **Network level**

- Stabilises competition: The volume-price cap system can reduce competition within hospital networks by encouraging collaboration over competition, as financial pooling becomes necessary to maintain budget stability (but it requires that budgets are allocated to hospital networks and not to individual hospitals).
- Rationalisation of care: This system (when applied at network level) encourages hospitals to specialise in certain treatments and consolidate services, promoting efficiency and better resource allocation across networks.

- **Hospital level**

- Marginal cost reduction: As patient volume increases, the marginal cost of additional care decreases, so paying hospitals at reduced rates beyond volume caps still provides some reimbursement, recognising that fixed costs are already covered.
- Acceptable that hospitals do not receive a 100% tariff when the budget is surpassed. Yet, it will increase concertation/negotiation efforts.

Appendix 2.3.2. Disadvantages

- **General**

- Financial instability for hospitals: Hospitals face financial risks if patient volumes decline, as their fixed costs (e.g., infrastructure, 'minimal staffing ratio's') remain unchanged, potentially jeopardising their financial health.
- Waiting lists and delays: Once a hospital reaches its volume limit, patients may experience longer waiting times for care (especially when the price is too low to cover the costs), leading to delays in receiving necessary treatments.



- No incentive for quality: This system primarily focuses on controlling volume and cost, without necessarily encouraging hospitals to improve care quality. If not paired with quality-based incentives, it could reduce care standards.
- Risk of under-treatment when the cap is reached.
- Billing will be more complex especially when applied at the level of the medical specialism or at lower levels.
- The macro-level budget is still dependent on the hospital activity which might include a risk for the public authorities (depending on the caps).
- **National level**
 - Surpassing the budget signifies that every hospital is penalised.
- **Network level**
 - Financial insecurity: Hospital networks must collaborate closely and manage shared budgets, which might introduce difficulties, especially in regions with varying healthcare needs or population characteristics.
- **Hospital level**
 - Fixed costs challenge: When patient volumes drop, hospitals' fixed costs remain, putting them in difficult financial positions, particularly for hospitals with lower patient volumes or those in rural areas. Very high risk for hospitals (compared to payer).
 - Overemphasis on admission numbers: Hospitals might focus too much on controlling admissions rather than collaborating with primary care providers or focusing on broader health outcomes.

Appendix 2.3.3. Preconditions

- **General**
 - Incorporate outcomes and quality measures: The volume-price cap system must integrate quality metrics to avoid prioritising cost over care. Hospitals should be rewarded for efficiency and high-quality service delivery.
 - Separation of fixed and variable costs: A clear distinction between fixed and variable hospital costs is needed to ensure appropriate pricing models as patient volumes rise. After fixed costs are covered, price reductions should be carefully calibrated to account only for variable costs.
 - Hospital control over admissions: Hospitals must have sufficient control over patient admissions and discharge planning to effectively manage their volumes and avoid unnecessary admissions.
 - Coding control and penalties: Mechanisms to prevent the manipulation of coding for financial gain (e.g. up-coding) are essential, with penalties for hospitals that exploit such practices.
 - Proactive public policies: The public authorities should take proactive measures in overseeing the volume-price cap system to ensure it aligns with broader healthcare goals, including managing quality and preventing over-consumption or underfunding of services.
- **Network level**
 - Shared budgets for networks: Hospital networks must share common financial resources, which may require significant organisational changes and long-term planning (e.g. 5-10 years) to restructure how networks operate and allocate resources.
 - Periodic revisions: Regular revisions of volume-price caps are necessary to account for changing healthcare costs, evolving patient needs, and demographic shifts.



- How to involve the other partners in the area (GPs, nursing homes, etc.)?
- How to incentivise efficiency gains outside the hospital (home nursing, other care facilities): episodes of care?

- **Hospital level**

- Incentives for efficiency and innovation: The system must provide rewards for hospitals that increase efficiency, innovate in service delivery, or improve care quality.

Appendix 2.4. Feedback on all control mechanisms

Appendix 2.4.1. Advantages

- **General**

- Financial control: All models provide a structured framework to manage healthcare costs, enhancing financial predictability and stability for public health authorities.
- The system becomes more transparent when the preconditions are met (e.g. correct tariffs, caps taking into account needs of the population, etc.).

- **National level**

- National oversight: Each mechanism ensures centralised control over healthcare budgets, enabling the government to enforce financial discipline and prevent excessive spending.

- **Network level**

- Collaboration incentives: Hospital networks are incentivised to collaborate and share resources, leading to a more coordinated, efficient healthcare system (only when hospital financing also includes elements at the level of the network).

- **Hospital level**

- Cost awareness: Hospitals are encouraged to be more conscious of their spending and seek operational efficiencies within their budget constraints.

Appendix 2.4.2. Disadvantages

- **General**

- No quality incentives: A significant concern across all models is the lack of direct incentives to maintain or improve care quality. The primary focus on spending control may detract from the attention paid to care standards.

- **National level**

- Rigid controls: National-level mechanisms can be inflexible, leaving hospitals unable to adapt quickly to unexpected healthcare demands.

- **Network level**

- Competition issues: Control mechanisms at the network level can foster competition rather than collaboration, which may undermine the goal of creating a cohesive healthcare system unless budgets are also allocated at the network level.

- **Hospital level**

- Financial risk: Hospitals face financial instability, especially smaller facilities, if patient volumes drop or fixed costs are not adequately covered, which could jeopardise their sustainability.



Appendix 2.4.3. Preconditions

- **General**

- Transparency: Clear, transparent rules regarding budgets, pricing, and penalties are essential to ensure hospitals understand expectations and can operate within set limits.
- Focus on quality: Mechanisms must prioritise quality of care, ensuring that spending control does not overshadow patient outcomes or service standards.
- Avoid privatisation: It is important that these models do not inadvertently promote privatisation or a shift toward for-profit healthcare, which is currently not the norm in Belgium.
- Definition of needs: There must be a clear method to define and measure healthcare needs at both regional and national levels, ensuring fair budget allocations.
- Address low occupancy rates: Hospitals with low occupancy rates should be evaluated to determine their appropriate level of activity and financing, preventing unnecessary strain on resources.

- **National level**

- Regular reviews: Lump-sum budgets, pricing models, and volume caps should undergo regular reviews to ensure they remain relevant to evolving healthcare costs and demands.

- **Regional level**

- Equitable distribution: Budget distribution must account for demographic and healthcare demand variations across areas to ensure equitable access to care.
- Adaptability: These mechanisms, when tailored, need to be adapted to meet regional healthcare needs and demographic differences, promoting a fairer resource distribution.

- Regional control: With aligned budgets, control at the regional level becomes more feasible, provided that resources are distributed fairly and appropriately.

- **Network level**

- Network organisation: Hospital networks must function cohesively, with shared financial resources and common goals, to ensure success under new funding models.

- **Hospital level**

- Coding and cost controls: Strong oversight on coding and billing practices is critical to prevent manipulation, with penalties applied to hospitals that exploit the system.



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