International approaches to clinical costing

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Foreword

The importance of cost data and costing in the English NHS is growing. Cost data – particularly where the costs are calculated at the individual patient level – can provide a window on variation. It can help organisations to better understand where and why costs are arising and inform the development of pathways that deliver better value for patients and taxpayers.

Cost data is also vital to inform payment systems, enabling prices and funding mechanisms to be developed that incentivise the delivery of effective and efficient care.

To do these tasks well, cost data needs to be robust. It needs to be produced in a consistent way using allocation and apportionment approaches that, as closely as possible, reflect the resources consumed in different interventions and take account of patient complexity.

There is significant interest in improving the costing process in England. The HFMA produces *Clinical costing standards* to support organisations in compiling patient-level costs. And sector regulator Monitor has been looking at options to improve the cost data that informs its new price-setting role. Both organisations are keen to understand other health systems' approaches to costing.

This report has been undertaken by the Imperial College Business School's Health Management Group to compare current approaches to costing, primarily across Europe.

Commissioned by both the HFMA and Monitor, the report offers some observations and conclusions in passing. However, its main purpose is to provide a baseline report on current international approaches to costing and the different uses for costing data.

The findings reveal wide-ranging practices and uses for costing data, and provide opportunities for all health systems to learn and potentially improve their own approaches. The HFMA hopes to build on this initial baselining exercise to understand more about how key issues are being tackled in some of the health systems that have made the most progress with costing.

John Graham, chair, HFMA Costing Practitioner Groups

Executive summary

Context of the research

Cost data is a vital part of any healthcare information system. It informs various decisions at provider and also at more aggregate levels (regional, national, international). At a healthcare provider level, cost data informs local management decisions and enables comparison or benchmarking across different providers. At a national level, cost data from provider costing systems informs economic evaluations and the development of funding/payment systems. At an international level, cost data potentially allows for the costs of different systems to be analysed alongside other outcome measures.

Increasing cost pressures and demands for transparency in the field of healthcare expenditure suggest an even greater role for cost data going forward.

The important and increasing role of cost data means there is growing interest in the processes and methodologies used to derive it. There is also growing interest in adopting a consistent approach to costing (within and across systems) and understanding differences in approaches and their likely impact on the quality of the reported cost data.

There is considerable diversity in the approaches used by different health systems to calculate cost data, and in how the data is used. This research maps out costing practices across a number of international health systems.

What did we do?

Over the last three years the Health Management Group at Imperial College Business School (funded through the Health and Care Infrastructure Research and Innovation Centre, HACIRIC) has worked with a network of international researchers to review approaches to costing of healthcare activities (clinical costing). The countries involved have included Denmark, Estonia, England, France, Germany, Ireland, Italy, the Netherlands and Portugal, alongside the Canadian province of Quebec.

This study was based on researchers' answers to a common set of questions. This was followed up with a two-day workshop in November 2012 in London, where the researchers discussed the different approaches to costing and the guidance used across different jurisdictions to inform the costing process. The workshop also incorporated a forum to share and discuss preliminary findings with a range of UK healthcare costing practitioners and regulators.

Findings

All jurisdictions involved in the study have a funding system based on activity (some of which are similar to England's payment by results system). But there are major differences in their approaches to producing cost data to inform these systems, as set out in each jurisdiction's respective costing guidance.
The key differences relate to:

- Costing methodology
- The level at which costs are reported (for example, specialty, diagnosis-related group (DRG)* or patient level)
- The level of prescription in the guidance
- The approach to enforcing compliance with the guidance
- The arrangements for developing and maintaining the costing guidance.

In terms of costing methodology, we have found that costing guidance usually contains a mix of different approaches, including both top-down and bottom-up methodologies. This is at odds with the impression given in journals and papers, which usually assume costing follows either one methodology or the other. We have also found that costing guidance is greatly influenced by the wider environment, in particular the

Note

** England has developed its own system of healthcare resource groups (HRGs). They differ from DRGs in that they take more account of the principal procedures involved in treatment. In referring to DRGs, this report means all similar forms of patient classification systems including HRGs.*

approach to funding hospitals, patient classification systems and financial accounting standards. We have found that these wide-ranging influences make analysing cost data across jurisdictions complex.

Considerations for policymakers

Our discussions with representatives from different healthcare systems and analysis of current costing practice suggest that good cost data depends on:

- Providers taking a consistent approach to collect the underlying finance and activity data that supports the costing process
- Detailed and clear costing guidance
- A high level of validation and audit to ensure only data meeting the required standards is used.

With these points in mind, we have identified a number of areas that we believe should be considered as part of any plans to improve the quality of costing. Our proposals are considered in three broad sections, although the areas and issues are interrelated.

1. Improving the costing process and cost data

- **A common language** There would be wide ranging benefits if the vocabulary and concepts used in costing were more clearly defined.
- **Demonstrating the quality of the costing process** Views of bottom-up approaches to costing as 'good' and top-down approaches as 'poor' are too simplistic. Instead, jurisdictions should explore other ways to understand the overall quality of a costing process and cost data produced.
- **The role of the chart of accounts** A common chart of accounts used by all providers provides the best foundation for designing costing systems. Where a common chart of accounts does not exist or cannot be introduced, greater levels of detail are likely to be needed in costing guidance to ensure costs are identified and treated in a uniform way.
- **The development of costing guidance and patient classification systems** Patient classification systems such as the DRG system are closely linked to costing. These systems set the cost objects for healthcare providers. However, analysis of costing data should also inform the development of classification systems. Where separate organisations are responsible for these activities, they need to work closely together.

2. Using the data

- **The purposes for costing data** While setting prices for hospital funding systems has driven the development of costing and costing guidance, using costing data to inform local decision-making has become a pressing issue for many providers. Even where different guidance exists to support different purposes of costing data, policymakers should consider how this guidance can be aligned.

3. Costs and benefits

- **Cost collection and audit** The costs for the whole system – incurred by both the central and local organisations – need to be considered when developing collection and audit arrangements. Further work is needed to understand the pros and cons of options, including collecting costs only from a sample of organisations, as well as the role of self-assessment.
- **Data availability** The availability of data on cost drivers for different resources is often the key determinant in the accurate allocation of costs. Organisations start from different positions in the availability of data and data systems, and costing guidance and requirements should take into account the potential costs in meeting required standards.

SECTION 1

Introduction

The objective of this report is to map out international approaches to costing healthcare activities (clinical costing). At present this mostly relates to acute healthcare, although with many health systems looking to move more services into community and primary care settings, the focus for costing will need to expand over the coming years. The study and this report focus on the costing guidance* that is used to support the calculation of costs at the healthcare provider level.

Costing guidance dictates the design of costing systems at provider level. Providers' costing systems are a fundamental building block of any healthcare information system. Increasing cost pressure, along with demands for transparency in the field of public healthcare expenditure, has raised the importance of available cost information. At a national level, the cost data from providers' costing systems informs economic evaluations and the development of funding/payment systems.

In particular, cost data is increasingly used as the basis for calculating diagnosis-related group (DRG) prices. At a local level, provider cost data informs management decisions and creates the potential for variation analysis and benchmarking within and between service lines and between different organisations. At all levels, cost data is critical for cost containment efforts and is increasingly seen as a means to identify opportunities for service and value improvement. The quality of cost information for health services is therefore essential for informed decision-making at both national and provider levels.

However, recent research has identified a continuing lack of quality cost information within healthcare (*Chapman and Kern 2010*[1]*; Northcott and Llewellyn 2004*[2]*; Monitor 2012*[3]). Poor-quality cost data – or unexplainable variation in cost data – could lead to prices that fail to provide appropriate funding for providers. Furthermore, poor-quality cost data reduces the accuracy of economic evaluations and may impair investment decisions about the introduction of innovations into healthcare. At a local level, poor-quality cost data may undermine proposals or business cases for service change. High-quality cost data will lead to greater consensus over proposals and enhance engagement between management and clinicians.

A better understanding of the similarities and differences between approaches to clinical costing across jurisdictions can support policymakers in considering such choices. A central finding of this report is that guidance to inform clinical costing at the provider level cannot be seen in isolation, but is influenced by the wider context in which the healthcare system operates. In Section 2 we analyse the ways in which particular payment systems, patient classifications systems, financial accounting, and institutional actors such as regulators and governments, can influence the nature and role of cost information.

We have also found that costing guidance describes a range of fundamentally different costing methods. Some countries pursue a broadly top-down approach, while others build costs from the bottom up. There are also differences between what is actually costed. In some countries the focus is on the costs of individual patients, while others only look to identify costs at a higher level – DRGs, specialties or service lines.

Some jurisdictions, such as Denmark, Germany and the Netherlands, have introduced mandatory bottom-up patient-level costing guidance. Increasing numbers of providers in England have introduced patient-level costing to support local management and there is a long-term ambition to base prices on more granular patient-level costs. There is non-mandatory, national clinical costing guidance to support the compilation of patient-level costs and the new pricing regulator has indicated this could become mandatory in future. This sits alongside mandatory costing guidance to produce DRG-level costs, which has traditionally involved a largely top-down costing approach. France, Ireland and Portugal also have costing guidance that is based on top-down specialty costing. However, Ireland is also undertaking a pilot implementation of bottom-up, patient-level costing.

Note

** There is a distinction between costing guidance and costing standards. Costing guidance often prescribes the processes that should be followed when compiling costs – for example, to inform prices. It aims to ensure meaningful cost allocation and consistency in approach. Costing standards set out accepted best practice in costing and may be aspirational for some organisations. In this publication we use the term 'guidance' to cover both guidance and standards.*

SECTION 2

Overview of approaches to clinical costing across jurisdictions

This section provides an overview of the diversity of approaches to clinical costing across the jurisdictions involved in the study. In particular, we compare the guidance used to support the costing process and how the data is used.

1. Purposes for costing

In most jurisdictions, costing information is used for three main purposes:

- Internally at provider level to produce cost reports
- To inform prices at national and/or local levels
- To benchmark unit costs and cost breakdowns between provider organisations. In addition, benchmarking can be used within an organisation – for example, reviewing variations in costs between clinical teams.

However, many jurisdictions also point to the use of costing information to inform the development of patient classifications. Patient classifications – for example, using DRGs or healthcare resource groups (HRGs) are ways of grouping similar treatments or interventions that consume similar levels of resources. Analysis of cost data within one classification could suggest the creation of further classifications that provide better and more meaningful groupings to inform better decision-making or tariff setting.

Table 1 summarises the key purposes across the participating jurisdictions.

Table 1: Overview of purposes of clinical costing

	Produce cost reports for use in hospitals	Inform/set national prices	Inform/set local prices	Benchmarking with other providers	Other (please specify)
Denmark		●			Regional transfer prices and to assess private hospital costs
England	●	●	●	●	HRG development/ economic evaluation and academic research
Estonia	●	●		●	
France	●	●		●	DRG system development
Germany	●	●		●	DRG system development
Ireland	●	●		●	Ad hoc data requests, eg freedom of information
Italy	●	●	●	●	
Netherlands	●	●	●	●	Economic evaluations, academic research
Portugal	●	●			Economic evaluations, academic research
Quebec	●	●			

2. Costing development in different care settings

Care can typically be viewed as being delivered in three distinct settings: acute, mental health and community. Across the jurisdictions, there has been greater progress made with the costing of acute healthcare. In many cases, this is because of the existence of a much more established currency (typically based on DRGs) and greater availability of data in the acute setting. While other areas are also costed – mental health services, for example – there is often less confidence in the costs produced because of

poorer quality data over specific service user interactions, and there hasn't been any external payment impetus to drive improvements in quality. Community services face similar challenges to mental health.

To examine this in more detail, we looked at the costing guidance available in the different jurisdictions to guide the compilation of costs in different settings. Our research found that all jurisdictions published costing guidance for acute care. Although most jurisdictions claim to have guidance for costing mental healthcare, this includes different levels of detail. For example, England and Germany have developed detailed guidance to cover patient-level costing for mental health. However, this guidance does not always follow the same level of detail as the acute guidance. Only Portugal and England (reference cost guidance) have specific costing guidance for community care.

There is increasing recognition of the need to improve understanding of costs in mental health and community services as many 'transformation' models are looking to move services out of hospitals. In addition, there is a drive from payment systems to develop costing in this area to support payment of activity across the patient pathway. This has led to significant activity in some jurisdictions.

For example, in England the long-standing top-down costing guidance (leading largely to the production of DRG-level costs) has included mental health activity, with costs allocated to a currency based on occupied bed days, outpatient attendances and community contacts. But in recent years the NHS has introduced a new currency – care clusters – that focuses on the characteristics and needs of a service user rather than individual interactions. New guidance recognises that cluster costs may be produced either via a top-down or a bottom-up approach. Separate mental health clinical costing guidance is being developed (alongside more developed standards for acute healthcare) to support the bottom-up approach.

3. Development of costing guidance

There is a clear link between the origin/development of costing guidance across all jurisdictions and legislation concerning the financing of hospitals (see Appendix A). The United States first introduced a prospective payment system, paying hospitals for activity defined by DRGs, in the early 1980s, and over the last two decades many health systems across the world have followed this lead.

These changes to funding systems were driven by numerous aims. In England, a 'payment by results' DRG system was seen as a way of allowing funding to follow patients as they chose which provider they wanted to be treated by. It also provided incentives to increase activity and reduce waiting times. However, DRG systems are also seen as providing clearer links between activity and funding and provide opportunities for governments to incentivise particular responses by providers and drive efficiency.

Although approaches to setting prices for DRGs differ from jurisdiction to jurisdiction, all approaches are informed in some way by a cost collection. And it is primarily to underpin this cost collection and ensure consistency that national costing guidance has been introduced and developed.

In many jurisdictions, local organisations have used the same guidance as the basis for preparing cost data for local management purposes.

There are also some instances of additional or different guidance being developed to support local uses. For example, in England and France, provider organisations have been encouraged to use cost information to improve local performance and organisational efficiency. The regulator in England has supported a management approach – termed service line management – to help organisations understand income and costs at the service line level to inform the management of those services. Standard reports and supporting material have been produced to assist hospitals and this has included guidance on costs that should be included within measures of profitability.

4. Costing methodology

Our research suggests that accounting textbooks and academic literature do not adequately reflect how costs are calculated in practice and have a tendency to be vague in their use of vocabulary and concepts around costing methodologies. This has led to a lack of clarity around costing language in general. There is also a tendency to use the same terminology to mean different things.

These different definitions exist both across jurisdictions and within individual healthcare systems. For example, in some jurisdictions, patient-level costing implies calculating patient costs based on a detailed bottom-up costing process. In other jurisdictions, 'patient' costs have been derived through a process of top-down averaging, allocation and apportionment. This looseness of language can make it harder for non-accountants to understand costing and could hinder the engagement of clinicians in costing – widely recognised as a key factor in ensuring robust costs.

The glossary section at the back of this report defines some of the key concepts used in costing, but below we look in detail at two key issues where clarity is essential:

- The cost object – what you are costing
- Top-down versus bottom-up costing.

Cost objects

A cost object is a product or a service for which costs are accumulated and measured. Across the jurisdictions studied, there are typically three key cost objects used: the DRG; the speciality/service line; and the patient. Cost objects are frequently determined by the funding model, with cost objects aligning with the packages of care for which tariff prices are set – often referred to as the currency.

Using the patient as the cost object offers the greatest flexibility. True patient-level costs, calculated by accurately assigning the specific costs incurred by individual patients to those patients, can be aggregated up to provide DRG or specialty level costs. But these costs will always be able to be interrogated to understand how individual patients have driven these higher level costs.

Using the DRG or specialty/service line as the cost object may provide useful overarching performance information, but may not provide sufficient detail to effect changes. For example, DRG costs may tell an organisation that it has high average costs for a specific intervention, such as a hip replacement. But they do not offer any pointers as to the cause of those high costs. However, if these DRG costs are underpinned by robust costs at the individual patient level, the organisation may be able to understand the cost drivers. For example, the average DRG costs may be inflated by a small number of high-cost patients. This gives the organisation a better understanding of its cost make-up and enables it to make better informed decisions around service development. From a price-setting point of view, this deeper cost information could inform better designed prices that more accurately reflect the costs incurred in treating specific patients.

The guidance to support the costing of these different cost objects is underpinned by different enforcement regimes (see Table 2 on page 8).

The patient is mandated as the cost object in three jurisdictions: Germany, Denmark and the Netherlands. While in Denmark this patient-level costing guidance is mandatory for all providers, in Germany and the Netherlands it is mandatory only for a sample of providers whose data is used to inform the tariff. Ireland is currently running a pilot on patient-level costing across 15 pilot sites and English providers have also been encouraged to take part in a voluntary patient-level cost collection. In Quebec, a private company carries out patient-level costing for 21 hospitals. Bespoke guidance is entirely owned by this private company and is not publically available. The patient-level costs produced by the company are sent to the regional government.

The same costing guidance may, in principle, support different cost objects. For example, in Germany, patient-level costing guidance also provides guidance on calculating costs at cost centre and DRG level. Yet in some jurisdictions, different cost objects are supported by separate costing guidance. For example, England and Ireland have recently started to implement patient-level costing as an optional costing method with specific patient-level costing guidance. This voluntary patient-level costing guidance is published alongside mandatory DRG-level costing guidance. In England, the two sets of guidance are claimed to be compatible. Organisations undertaking patient-level costing should be able to use those costs with a few adjustments to feed their mandatory DRG return.

Germany has comprehensive guidance for providers in its tariff-setting sample. However, all providers, including those outside the tariff sample, are required to follow cost centre-level costing guidance. In Italy, there is different costing guidance at regional levels and at national level. The regional guidance is aligned

and compatible with the national guidance. There is a national tariff, which regions are free to adopt or set their own tariffs, with the national tariff as the maximum.

Different approaches are used by jurisdictions to produce costs for different cost objects. Some jurisdictions cost to specialty or service line level and then apply standardised DRG cost weights to produce DRG-level costs. This is the approach adopted by Portugal, Estonia and Ireland. For example, in Portugal the Maryland cost weights are used. These weights are the sum of the patient-level costing data for close to one million patients in the state of Maryland, US, broken down into cost centres (laboratory costs, drugs, theatres and so on). Maryland cost weights provide a standardised weighting at DRG level which can be used by other organisations to break down specialty-level costs to produce DRG-level costs.

Portugal uses the Maryland cost weights, with some adjustments to calculate Portuguese prices. These adjustments are made on the basis of costs occurred in the Portuguese NHS hospitals. In the state of Maryland, the Health Services Cost Review Commission (HSCRC) – www.hscrc.state.md.us/index.cfm – updates cost weights annually. Portuguese cost weights are updated when a new version of the grouper is adopted.

Table 2: Main cost objects of calculation

JURISDICTION	DRG	SPECIALTY/SERVICE LINE	PATIENT
Denmark	M	O	M
England	M	O	O
Estonia (1)	N	O	O
France (2)	M	M	O
Germany (2)	M	M	M
Ireland	M	M	N (yes* 15 pilot sites)
Italy	M at national level,	M at national level	N
	O at regional level	N	
Netherlands	M	M	M
Portugal (3)	N	M	M/O
Quebec (4)	M	N	N

KEY
M=mandatory O=optional standards to support N=not formally supported
(1) No mandatory costing guidance, but the cost model underlying health insurance reimbursement prices impacts hospital costing systems.
(2) Information applies to hospitals that voluntarily participate in the cost data collection sample.
(3) Costs are calculated at patient level but are not collected at patient level.
(4) 21 hospitals carry out patient-level costing. They have outsourced cost accounting to the same private company, MédiaMed Technologies.

Top-down versus bottom-up costing
We find that costing – both in practice and as described in guidance – usually consists of a mix of methods rather than following one single approach.

Direct cost example
If we take an example of a direct cost, such as theatres, the English clinical costing guidance prescribes different ways to attribute costs to patients. One way is to divide total operating theatre costs out across the total number of patients. This is a top-down approach since each patient bears an equal fraction of the total cost. Another way is to calculate total operating theatre costs divided by the number of patient minutes available and to charge each patient based on their time in theatre. This is a bottom-up approach.

The English patient-level costing guidance therefore includes examples of both approaches to calculating costs. The option selected by each organisation may depend on the availability of data or the methodology of costing preferred by the specific organisation. An important implication of this distinction

is that in top-down approaches there is the risk that cost will be linked to cost objects in ways that do not reflect their actual behaviour, since the cost is being artificially linked at a more granular level than that at which cost information is collected. This raises the spectre of arbitrary allocations.

Even within bottom-up approaches, there can be different levels of sophistication in reflecting the actual consumption of costs. For example, costs could be allocated based on an average number of minutes used or using actual patient minutes.

Indirect cost example
German patient-level costing guidance allows for indirect costs to be allocated to cost objects based both on volume and on activities. These are both top-down allocation methodologies, but the activity-based approach allows costs to be allocated with greater accuracy. For example, two options are described for the treatment of costs of the executive management team. Costs are either allocated on the basis of expenditure or the number of full-time employees. These are both top-down costing approaches.

These examples highlight how some indirect costs are allocated to direct cost centres. Under German costing guidance, a different bottom-up costing approach may then be used to allocate these 'absorbed' direct costs to patient level.

For example, in the German costing guidance, the costs of operating theatres are allocated to patients on the basis of theatre minutes, taking into account turnaround time and the intensity of labour (the hours worked by staff for the operation). This demonstrates that costing guidance and costing systems at the provider level consist of a mix of methods – top-down/bottom-up costing.

To further illustrate the distinction between the different costing methods, this section examines the treatment of estate costs in more detail.

Top-down and bottom-up costing: estate costs
A top-down approach to the allocation of estate costs would involve dividing them across all service lines, often on the basis of service line expenditure. The cause-and-effect relationship between estate costs and number of service lines is then weak. However, a more accurate way of allocating costs is to use activity information as the cost driver. This would involve, for example, allocating costs based on the square metres used by different cost centres. The analysis of national costing guidance across jurisdictions shows that this is a common way of allocating estate costs.

However, differences appear in the second step of the costing process, which is when costs are attributed to patients or units of activity. If estate costs at a cost centre/service line level – for example, in the operating theatre – are now divided by the number of operations or patients, this corresponds to a top-down approach.

However, if these estate costs are then allocated to patients on the basis of activity cost drivers (see box overleaf), then a clear cause-and-effect relationship between estate costs and patients will be established. So, in essence, we have a two-stage process. Top-down allocation of estate costs to the operating theatre cost centre is followed by a bottom-up allocation of these costs to patients.

In this example it is usually the lack of available information that prevents a bottom-up methodology from being used in the first stage because these costs cannot be accurately traced to their cost centres, service lines or even patients. Therefore proxy measures, such as floor area, are consistently used across jurisdictions.

Table 3: List of cost drivers to link estate costs with patients in the German costing guidance for providers informing the tariff (*Source: Kalkulationshandbuch_V3_070918*)

COST CENTRE	COST DRIVER
Ward	Days of care
Intensive care unit	Hours of intensive care
Dialysis	Weighted dialysis according to different kind of dialysis
Operating theatre	Knife to skin time with set up time
Anaesthesia	Time of anaesthesia: taking over of the patient with set up
Delivery room	Time of the patient in the delivery room
Cardiologic diagnosis/therapy	1. Time of the intervention 2. Points according to the service catalogue
Endoscopic diagnostics/ therapy	1. Time of the intervention 2. Points according to the service catalogue
Radiology	Points according to the service catalogue
Laboratory	Points according to the service catalogue
Other diagnostic and therapeutic areas	1.Time of the intervention 2. Points according to the service catalogue

Given that the objective of costing is to make costs transparent by creating cause and effect relationships, the greater use of methodologies that reflect these relationships, the better the quality of the cost data produced. Bottom-up costing is more likely to achieve this. Furthermore, patient-level information allows costs to be more easily linked to quality, which is essential for evaluating services in healthcare (*Kaplan and Porter 2011*[4]). Yet these methods of producing quality cost information are often more resource-intensive, and are dependent on the availability and collection of cost driver data. Therefore, given the trade-off between the cost of producing the data and the quality of the cost information produced, it is not surprising that in practice costing guidance and systems usually consist of a mixture of different methodologies – top-down, and bottom-up, particularly for those costs that are immaterial in value.

Our analysis suggests all jurisdictions studied are using a mix of top-down and bottom-up methodologies. Labelling a system as either top-down or bottom-up is at best unhelpful and likely to be misleading.

A better approach might be to make an assessment of the overall quality of the costing approach based on the mix of methodologies used.

A self-assessment tool described in English costing guidance offers one way of realising this. The Materiality and Quality Score (MAQS) system provides an organisation with a score for its costing process based on the quality of the allocation methods used for different cost groups, taking into account the amount of resources allocated and the ability to match those resources to patients. The closer the cost calculation is to actual consumption of costs – the stronger the cause-and-effect relationship established – the higher the score assigned, rating the choice of cost driver as baseline, bronze, silver or gold. This enables providers to better understand the functioning of their costing system, and also how best to target resources to maximise improvements in the quality of the cost information produced.

5. Relationship between costing guidance and financial accounting standards

In this section, we analyse the relationship between costing and financial accounting standards using two countries as examples: England and Germany. We have chosen these examples because they have different links between costing guidance and financial accounting standards. We were keen to explore the hypothesis that greater links support greater consistency in costing across organisations. We will first look at the historical context for financial reporting in each country.

In England, until the 1980s, there was a centrally (at regional level) defined general ledger, including a detailed chart of accounts. This common ledger was operated using a standardised and centrally controlled information system. As information technology developed, providers did not want to be dependent on this central IT system anymore. Furthermore, as a result of reforms starting in the 1990s, providers have become more autonomous. This resulted in providers building up their local IT systems and general ledgers. The mandatory chart of accounts prescribed high-level accounts with the detail of the accounts defined by individual providers. The two different sets of costing guidance published in England – reference costs and the more recently developed clinical costing guidance – do not directly link to general ledger accounts. So, for example, costing guidance cannot simply prescribe that organisations assign all the costs within a specific cost centre or account code to a specific cost pool.

At the provider level, the absence of detailed mandatory general ledger accounts creates difficulties when designing costing systems, particularly patient-level costing systems. For example, costs will be captured differently in different organisations. Costs such as prosthetics may be captured in one cost centre in some organisations, but in a different cost centre using different account codes in other organisations. To produce comparable cost data, costing practitioners need to design costing systems that allow for these differences. Interpreting exactly which costs are in which cost centre or account code can be difficult. At a national level, the issue of how to reconcile the ledger with the costing system requires local solutions to be found. Local solutions may then negatively impact on the coherency of cost data at the national level.

In contrast to this approach, Germany has a detailed chart of accounts which is mandatory for all providers (public or private). This chart of accounts was introduced in 1978, at the same time as costing guidance. Each detailed general ledger account is linked to a category of cost (Kostenart) and cost centre (Kostenstelle) in the costing guidance. The structure of these cost centres and cost pools and their link with the chart of accounts is then fully prescribed by the costing guidance. This includes the definition of the nature of each cost centre – an indirect cost centre or direct cost centre, and transfer pricing.

The integrated definition of both chart of accounts and costing guidance facilitates costing system design at the provider level and the coherency and quality of costing data at the national level. This link facilitates reconciliation and the audit of cost data and compliance checks of standards.

6. Relationship between costing and patient classification systems

There are tens of thousands of procedure and treatment codes used to describe conditions and healthcare interventions. Examples of systems used include the International Classification of Disease (ICD) system and the Office of Population Censuses and Surveys classification of interventions and procedures (OPCS). While these coding systems are vital to support clinical activity, costing or paying for activities at this level would be unworkable. So patient classification systems (such as DRGs) have been developed to group patients into a manageable number of meaningful groupings on the basis of diagnoses and interventions that consume similar levels of resources. Allocation of a patient to a grouping such as a DRG is typically performed by software (known as a grouper in England, for example).

Costing is inextricably linked with patient classification systems, such as DRG systems. At the most basic level, patient classification systems define the main cost objects required for the cost calculation. However, analysis of costing data should inform the development of DRGs. As DRGs are designed to be ISO-resource – they group together treatment episodes that consume similar levels of resources – costing information is a good way of confirming the appropriate inclusion of activities within defined groupings. Equally, analysis of cost data for different patients within a single DRG could suggest the creation of further DRGs to provide a more granular classification.

The growth in patient classification groups is highlighted in Table 4 below. It shows numbers of groups increasing over time in Denmark, England, Estonia, France, Germany, Ireland and Portugal. Only in the Netherlands can we see a recent decrease in the number of patient groups. This may also be linked with the Netherlands having chosen a very different classification system with a very high number of patient groups (see Appendix A).

Patient classification systems are in general used to inform or set the financing for providers, forming the currency for tariffs in many jurisdictions. Major changes in financing mechanisms also influence patient classifications systems and then costing guidance.

Broader changes to payment systems can also have implications for costing, in effect creating new or additional cost objects. For example, new year-of-care or pathway tariffs may require practitioners to cost whole patient journeys (including support and treatment both in and outside hospital settings). Bottom-up, patient-level methodologies may be more suitable for this analysis. In particular, bottom-up, patient-level costing may be more suitable to take into account the costs of pathway tariffs (*Kaplan and Anderson 2007*[5]*; Kaplan and Porter 2011*[4]). Time-driven activity-based costing (TDABC) is a bottom-up method that is seen as being able to assess the quantity of each resource consumed for the complete cycle of care of a patient (*Kaplan and Porter 2011*).

Table 4: Number of patient groups per jurisdiction and how this has developed over time

	HOW MANY NOW (LATEST UPDATE)?	HOW MANY AT START?
Denmark	About 1,000	532
England	2,100	650
Estonia	786	496
France	2,297	480
Germany	About 1,200	664
Ireland	698	495
Italy	538	489
Netherlands (1)	About 3,000	About 30,000
Portugal	669	470
Quebec	1,530	328

(1) For an explanation of the patient classification system of the Netherlands, see Section 3.

7. Quality and compliance checks

Given the uses of cost data, it is important to ensure that cost data is of high quality. We found three types of quality and compliance checks being undertaken on the data used and produced in the costing process. These included checks on:

- Clinical data
- Financial accounts data
- Costing data.

In all jurisdictions, there are regular checks on the quality of clinical data – for example, checking the quality of clinical coding. Procedures for these checks mostly follow national guidelines and are typically carried out through internal and external audits.

All jurisdictions also undertake checks on the compliance of the financial accounts. These checks are carried out through external audit firms, and may also involve internal audits. Some jurisdictions also check the quality of costing data and compliance with prescribed costing guidance. Table 5 maps the different approaches to quality and compliance checks.

Table 5: Approaches to quality and compliance checks of costing data

	CHECKS ON COST DATA
Denmark	• There is currently no external audit of cost data – however, an internal rating system has been developed by central administrators and is used in each hospital to assess the value of data inputs. Special attention is paid to those hospitals that provide both very low and high costs to the system. • In 2011, national auditing association Rigsrevisionen undertook a general review of processes. Based on its report, a rating model for checking compliance with the guidance has been developed by central administration and now used in quality checks.
England	• The HFMA, which develops clinical costing standards to support patient-level costing, has developed a MAQS score enabling hospitals voluntarily to self-assess the quality of their cost information. • There have been one-off audits of costing processes (with a further audit planned for 2012/13 cost data). • Templates used for annual cost submissions incorporate validation checks including reconciliation to the annual accounts. • Hospital boards are required to sign assurances on the quality of their costing processes.
Estonia	• Cost data of four hospitals in the sample is submitted and compared to the annual report and hospital contracts (Estonian Health Insurance Fund contracts with service providers specify the amounts and types of services that need to be provided).
France	• Compliance to the costing guidance is not assessed by external assessors nor by a formalised self-assessment exercise.
Germany	• Institut für das Entgeltsystem im Krankenhaus (InEK) – the organisation responsible for producing the costing guidance – checks the quality of data and compliance to the guidance among the providers in its sample. A three-step process assesses economic and medical plausibility. First, the minimum and maximum costs per module (such as costs of clinical staff per day, total cost of the hospital) and the ratios between modules (such as costs of the 'anaesthesia' or 'operating room' cost centres) are given an economic check. Second, there is a check on adherence to the German DRG classification codes (ICD-10-GM and OPS). Finally, there is a data plausibility check (for example, the costs per case of a hip replacement must reflect the material cost of a hip prosthetic). In 2009, after these checks, it was reported that 72% of 4.5 million records were made available for tariff calculation.
Ireland	• Chief executives/hospital managers must sign a declaration stating that the costing file has been completed in accordance with the costing manual. • Each hospital's file is subjected to a review by an accountant via a standard review file to ensure compliance. Comparisons are made between a hospital's current and previous years and between peer hospitals. Issues are queried with hospitals and adjustments made until the reviewer is satisfied with the file. • Each hospital is required to keep an audit file to facilitate an on-site compliance audit if deemed necessary. • A sample of hospitals are audited as needed, based on issues from the review process. • Typically hospitals submit up to four versions of a costing file on an annual basis before national casemix programme accountants sign off for inclusion in the annual casemix budget model process.
Italy	• There is no check on hospitals' compliance with costing guidance at national level. • There are checks on compliance with costing guidance at regional level. For example, the compliance checks performed in the Tuscan region are : o Formal control: The regional department controls the compliance with the use of cost centres and inputs (resources) and with the structure also defined by the regional department. o Substantial control: For each cost centre, the regional department verifies the consistency between costs and activities performed (surgeries, health services, hospitalisations) recorded in other regional information flows.

Table 5: Approaches to quality and compliance checks of costing data (continued)

	CHECKS ON COST DATA
Netherlands	• Hospitals are subject to an audit of financial data by external assurance providers. • Nederlandse Zorgautoriteit (NZa) – the Dutch health authority – uses a sample group of hospitals to produce specific unit cost information. The cost data of this group of hospitals is audited every year by an external assessor and compliance is also monitored through self-assessment. • Many hospitals calculate unit costs in a uniform way because they use the same software (developed by Tragpi). Tragpi uses a model certification procedure, which is not mandated nationally, to check costing data. The checks include: o Input audit (for example reconciliation with audited financial statements). o Output audit (for example, activity and DRG group unit cost prices within a realistic bandwidth). o Process audit (for example, a feedback process applied in the hospital organisation).
Portugal	• Compliance with costing guidance is monitored through audits of all hospitals (not in the same year) by external assessors and private companies hired for the task. • There are also audits specific to a given topic. • Hospitals are also required to self-assess their compliance with costing guidance. • The central health authority runs checks on an ad hoc basis.
Quebec	• There is no specific check on internal cost data.

8. Approaches to sampling of provider organisations

The way data is collected and used to inform tariff calculation differs from jurisdiction to jurisdiction. In some jurisdictions - Denmark, England, Portugal, Ireland and Quebec –all providers take part in a national cost collection and adhere to national costing guidance. In other jurisdictions – Estonia, Germany, France, Italy and the Netherlands – only a sample of providers submit data and only these organisations are required to follow set guidance. Ireland is running a patient-level costing pilot alongside its mandatory DRG collection. This pilot is based on a sample of 15 sites. Alongside its national cost collection involving all providers (known as reference costs), England was also running a pilot patient-level cost data collection in the summer of 2013, expected to involve about 70 organisations. There are perceived limitations with the reference costs data, which involves a largely top-down process to produce DRG-level costs.

There are pros and cons to the sampling approach. In health systems with significant numbers of providers, the use of a sample may decrease the overall costs of processing and collecting costs and also of the tariff calculation itself. Furthermore, sampling may make it easier to ensure compliance with guidance, as fewer compliance checks may be needed.

Denmark is the only jurisdiction in which bottom-up patient-level costing is mandatory for all hospitals. However, the total number of providers is relatively small. In contrast, Germany and the Netherlands have a larger number of providers and collect bottom-up, patient-level cost information from a sample of hospitals. Providers in the sample must follow mandated costing guidance and compliance is verified.

However, sampling raises questions around the representativeness of providers included and the optimum size for the sample. A representative sample will need to reflect the mix of public and private providers and a range of size of providers, both of which could have an impact on costs. The status of a provider as a teaching hospital, or its level of specialist activity compared with routine services, may also have an impact. The relative efficiency of providers is also important depending on the overarching tariff aims. If tariff prices are intended to reflect average costs, then the sample should reflect different types of providers with different levels of efficiency. But if tariff prices are supposed to reflect the costs in efficient providers, to drive efficiency across the sector, then the sample will need to reflect this.

Where participation in the sample is voluntary – which is currently the case in all 'sampling' jurisdictions – there is limited control over sample membership. Central bodies' only control would be to reject a

volunteering organisation from taking part. There is a theoretical disincentive for efficient providers to volunteer as this could lead to a reduction in tariff price. In terms of sample size, approaches vary widely across jurisdictions (see Table 6 in Appendix B, page 26).

9. The publication of cost data

All jurisdictions publish the cost data once it is collected. However, there are significant differences in the level of detail published and in the access allowed to the data. France and Germany provide the most detail to the general public, breaking down the published DRG costs by cost centre. This may facilitate benchmarking practices among providers and enhance accountability to the general public. The outsourcing of patient level costing to a private company in Quebec is coupled with limited access for both providers and the general public, as the data can only be accessed by providers in the sample and the Ministry of Health.

Table 7 shows different approaches to publishing the cost data across jurisdictions. We assessed the detail published and what access is available to this information.

Table 7: Publication of cost data

	COST DATA PUBLISHED?	DETAIL OF PUBLICATION	TO WHOM IS INFORMATION AVAILABLE?
Denmark	Yes	Calculated cost without further breakdown	General rates publicly available on health dept website. Hospital benchmarking available on restricted access site
England	Yes	Activity, average HRG unit costs and interquartile ranges and organisation-level source data	Published in national reference cost schedules. Publicly available on www.gov.uk
Estonia	Yes	Components and costs included in reimbursement price. Hospital costs not published	Available on www.riigiteataja.ee
France	Yes	Average DRG costs and breakdown by cost centre	Publicly available
Germany	Yes	Costs per DRG broken down by cost centre and cost element	Publicly available on InEK website www.gdrg.de
Ireland	Yes	Tariff per DRG made available to hospitals and health system. Hospital specialty-level costs shared among hospitals involved	Hospitals and the health system
Italy	Yes	No specific hospital costs published	
Netherlands	Yes	Average of cost data available, but not for specific hospitals	Only average cost information available to national health authority and participating hospitals. In some cases, small subsets of cost information are shared. Not for public view
Portugal	Yes	Total average cost per patient (national, hospital, service)	Publicly available at www.acss.min-saude.pt/bdea
Quebec	Yes	DRG by hospital	Limited access: only available to hospitals and Ministry of Health

SECTION 3

Considerations for policymakers

Our discussions with representatives from different healthcare systems and analysis of current costing practice suggest that good cost data depends on:

- Providers taking a consistent approach to collect the underlying finance and activity data that supports the costing process
- Detailed and clear costing guidance
- A high level of validation and audit to ensure only data meeting the required standards is used.

With these points in mind, we have identified a number of areas that we believe should be considered as part of any plans to improve the quality of costing. Our proposals are considered in three broad sections, however the areas and issues are inter-related.

1. Improving the costing process and cost data

- **A common language**

  Regulators and healthcare organisations should work together to clarify and define the vocabulary and concepts that are used within costing processes and included in costing guidance. This will enable non-accountants to engage more easily with costing. Better understanding of costing aims and approaches is essential for engaging clinicians, who are rightly seen as having a major role both in refining the cost data produced and in using the resulting data to inform decisions around services, including investment and disinvestment. A common language used by practitioners within a jurisdiction will also facilitate discussions between practitioners and support better comparisons of approach between different providers. Looking more broadly, a common language across jurisdictions would facilitate research and collaboration. However, even if this cannot be achieved, clarity about national definitions and terminology would enable all stakeholders to understand differences in approach or meaning.

- **Demonstrating the quality of the costing process**

  Costing of activities at the individual patient level using robust bottom-up allocation methodologies will provide the best opportunity to understand relationships between costs and different interventions, between cost and quality and between cost and outcome. However, viewing all approaches labelled as 'bottom up' as good quality, while 'top-down' approaches are viewed as poor, would be too simplistic. In reality, costing processes in all the jurisdictions studied are a mix of bottom-up and top-down approaches.

  There is clear value in being able to demonstrate the robustness of a costing process and of the cost data produced. There may be value in developing approaches to provide a better assessment of the quality of the costing process overall. The English MAQS system is one such approach and it may well be of interest to other jurisdictions to enable them to better describe the rigour of their costing approaches and to compare the quality of costing approaches in different providers.

- **The role of the chart of accounts**

  From our comparisons of costing guidance across jurisdictions, it emerged that there is a major link between the general ledger and costing guidance. If there is a mandated chart of accounts, defining the detailed accounts to be used by all providers in a jurisdiction, this directly supports the costing process and the drafting of costing guidance.

  Germany is an example where a detailed chart of accounts is prescribed. Each detailed account is linked with a specific kind of cost (Kostenart) and cost centre (Kostenstelle) (see Appendix A). This

link between the chart of accounts and costing guidance is believed to facilitate costing system design at provider level and improve quality of data at national levels.

For jurisdictions where no mandated chart of accounts exists, it may not be practical to impose one across organisations that have developed their own local approaches. Where this is the case, greater levels of detail are likely to be needed in costing guidance to ensure costs are identified and treated in a uniform way.

- **The development of costing guidance and patient classification systems**

Patient classification systems and costing are closely linked. Patient classification systems define the cost objects and thereby influence the types of cost centres, cost pools, and cost drivers used in costing processes. In turn, the analysis of cost data is the basis for the refinement of patient classification systems. For example, analysis of cost data could reveal that a single patient classification should be split to provide a better grouping of procedures/treatments that consume similar levels of resources.

Different jurisdictions take different approaches to the oversight of these linked activities. For example, in Germany and France a single organisation is responsible for both the maintenance and development of the DRG system and for the cost collection and mandatory costing guidance. In other jurisdictions these roles are carried out by different bodies.

However, it is clear that there are benefits to ensuring the processes are linked. This does not necessarily mean adopting the single body approach, as in Germany and France. But where responsibilities are split, the relevant organisations need to work closely together. This study has not explored the benefits of different approaches, although this could be worth exploring in future.

2. Using cost data

- **The purposes for costing data** While setting prices for hospital funding systems has driven the development of costing and costing guidance, using costing data to inform local decision-making has become a pressing issue for many providers. Even where different guidance exists to support different purposes of costing data, policymakers should consider how this guidance can be aligned.

3. Costs and benefits

- **Cost collection and audit**

The costs and benefits of cost collection and assurance systems should be considered when developing systems. Cost collection for national tariff purposes should draw on cost data produced by organisations to inform local decision-making (see 'Using cost data' above). Expecting organisations to submit cost data in a different format – or produced under different guidance – to that used locally will add unnecessary costs for local providers.

Thought also needs to be given to assurance processes. It is vital that tariffs – central to modern healthcare funding systems – are informed by robust costs. In addition, assurance systems are needed to ensure processes and data are fit for purpose – as well as to signpost opportunities for improvement. But a balance needs to be struck between the benefits of detailed audit and assurance and the costs of setting up and complying with these systems.

Some jurisdictions have chosen to collect costs only from a sample of providers. One of the consequences of this is to limit the costs of collection and assurance to the system as whole. A sample approach may make it feasible to have a more detailed assurance system and organisations outside the sample may avoid some of the costs associated with cost collection. However, there are other issues to be considered when assessing the value of a sampling approach. It may be difficult to construct a representative sample. There are also clear system-wide benefits in encouraging all providers – not just those in a cost collection sample – to improve costing to underpin local decision-making.

Further work is needed to understand the options, costs, benefits and potential funding

mechanisms for cost collection and assurance systems. This work should draw on existing models in operations across international healthcare systems and the options – such as self-assessment – being explored.

- **Data availability**

As discussed earlier in 'Demonstrating the quality of the costing process', patient costs, derived using robust, bottom-up allocation methodologies, are likely to provide data that best informs local decision-making and tariff-setting. However, the ability to allocate costs accurately is dependent on the availability of suitable cost driver data. This will not be available in all parts of all organisations. Feeder and data collection systems may well be needed and the costs of introducing these systems should be kept in mind when setting standards and developing guidance. Different organisations will start from different positions in terms of available supporting data and data systems. Costing guidance needs to take account of the potential costs in meeting required standards. In England, for example, the clinical costing standards identify different allocation methods depending on available data, and provide each method with a rating to reflect its relative quality in allocating costs.

Section 4

Overall conclusions and next steps

Approaches to costing vary significantly across the jurisdictions involved in this study. We found differences in the cost object – the actual product or service being costed – costed locally and submitted to the centre as part of a cost collection. In some jurisdictions, local organisations only submitted specialty-level costs – with the centre then using standardised DRG cost weights to produce tariff prices. In other jurisdictions, healthcare providers submitted DRG level costs, while in a small number of cases detailed patient level cost data is collected.

The processes also differ with a range of top-down and bottom-up apportionment and allocation. The exercise highlighted the different definitions and language used to describe approaches to costing both within individual jurisdictions and across jurisdictions. Greater harmonisation and clarity in language is one of the recommendations of this study. However, this clarity would also support greater learning across the jurisdictions.

This study was always targeted at providing a baseline report on costing practices across the jurisdictions. We have not aimed to provide a detailed evaluation of different approaches, structures or guidance. However, we have identified key differences in approaches to some of the main costing processes. There would be major value in following up this baseline work with a deeper drill down into some of these differences and sharing the learning across all jurisdictions to inform the development of costing and learn from different experiences and approaches.

We hope to take some of this work forward in the near future.

Glossary

This glossary defines the technical terms that are used in this report, with the aim of clarifying these terms for non-accountants in particular

Activity-based costing (ABC)
Activity-based costing (ABC) is an approach to attribute indirect costs to cost objects. It is an alternative to volume based attribution of indirect costs to cost objects (by allocating costs across volume). ABC makes cause-and-effect relationships visible by disaggregating indirect costs into the costs of activities for which cost drivers may then be found.

For example, if we take the costs of the finance department, this is an indirect cost because it is an aggregation of the many costs (for example, payroll, estates, and consumables) for which no single cost driver offers a clear reflection of cause and effect. Activity-based costing would break this total cost down into the cost of multiple activities (running the payroll or credit control, for example) for which cause-and-effect cost drivers can be found. Note: ABC can be based on a top-down or a bottom-up costing (see time-driven ABC).

Bottom-up costing
Bottom-up costing is an approach where the cost attributable to the cost object is a multiple of some more granular unit of costs. For example, in the case of the operating theatre, cost per theatre minute is multiplied by patient minutes to calculate cost per patient. Note that the choice of bottom-up/top-down is independent of other methodological choices, such as volume- or activity-based analysis of cost behaviour. In practice, pure forms of any of these choices are rare.

Casemix
The mix of patients treated in a hospital or unit. The term is often used to describe the mix of patients in terms of DRG patient groups.

Cause-and-effect relationships
The essence of a costing system, whether top-down or bottom-up, activity or volume based, is establishing cause-and-effect relationships between costs and the cost object. Cause-and-effect relationships make costs transparent and manageable.

Chart of accounts
Listing of the general ledger account names and structure of how costs need to classified.

Cost object
A cost object is an item such as a product, service, department, doctor, patient or group of patients for which costs are calculated.

Cost centre
A unit of an organisation for which its manager is responsible for the costs arising in that unit. In hospitals, these often correspond to clinical departments.

Cost drivers
The factors that most closely influence the costs of an activity or a certain kind of cost in relation to a cost object.

Costing method
The costing method defines how costs are calculated. The most common methods of calculating costs are:

- The definition of the main cost objects (for example, patient, DRG or speciality level)
- The disaggregation or aggregation of costs (top-down or bottom-up costing)
- The attribution of indirect costs to cost objects (volume or activity based).

Costing guidance may define different cost objects. They usually also consist of a mix of ways to attribute indirect costs to cost objects (volume- and activity-based), and a mix of aggregating and disaggregating costs (top-down and bottom-up costing).

Cost pool
All service costs (including direct, indirect and usually overhead costs) are grouped into cost pool groups to facilitate analysis. An activity-based approach to cost pools facilitates establishing cause-and-effect relationships (see ABC).

Costing standard
Costing guidance that sets out the principles for costing and therefore best practice. They may be aspirational for some organisations but help to identify a direction of travel for organisations wishing to improve costing.

Direct cost
In UK healthcare, a distinction is made between direct, indirect and overhead costs. In terms of cost analysis, however, the central distinction is between costs which may be related through cause-and-effect to cost objects (direct costs) and those that cannot (all other costs). Outside of the field of healthcare the terms indirect cost and overhead are generally used synonymously.

DRG system
A DRG (diagnosis-related group) system is a patient classification system that has four main characteristics:

- Routinely collected patient discharge data (mostly concerning patient, treatment and provider characteristics) used to classify patients into …
- A manageable number of groups (DRGs) intended to be …
- Clinically meaningful and …
- Economically homogeneous

Source: Diagnosis related groups in Europe, www.euro.who.int/en

General ledger
The system of accounting records of transactions relating to a company's assets, liabilities, owners' equity, revenue, and expenses.

Healthcare provider
An organisation providing healthcare services, such as a hospital.

Indirect cost
In UK healthcare, a distinction is made between direct, indirect and overhead costs. In terms of cost analysis, however, the central distinction is between costs which may be related through cause-and-effect to cost objects (direct costs) and those that cannot (all other costs). Outside of the field of healthcare the terms indirect cost and overhead are generally used synonymously.

Jurisdiction
A jurisdiction is an area with a set of laws under the control of a system or a government.

Patient classification systems
These systems group patients on the basis of defined criteria. Examples include diagnosis-related groups (DRGs) or healthcare resource groups (HRGs).

Patient-level costing
Calculating costs with the individual patient as the cost object.

Sampling
Sampling is the selection of a subset of healthcare providers to estimate characteristics of all providers. Two advantages of sampling are that the cost is lower and data collection is faster

Service line
A clinical unit that delivers healthcare services.

Speciality costing
Calculating costs for a specialty service. This could be based on a top-down or bottom-up methodology.

Time-driven activity based costing (TDABC)
Time-driven activity based costing is a development of ABC. The original ABC was often seen as a top-down costing approach. TDABC is the bottom-up development of ABC. It requires answering the following two questions:

- How much does it cost to provide resource capacity for each process?
- How much resource capacity (time) is required to perform work for each order, product or service?

Top-down costing
Dividing up total costs by the number of cost objects – for example, total operating theatre costs divided by the total number of patients – is a top-down approach. Here, each patient bears a fraction of the total cost. Note that the choice of bottom-up/top-down is independent of other methodological choices such as volume-/activity-based analysis of cost behaviour. In practice, pure forms of any of these choices are rare.

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Appendix A

A short summary of the evolution of healthcare or clinical costing for each jurisdiction covered in this report

Denmark
Costing guidance was introduced in 1999/2000 by the Ministry of Health (Sundhedsministeriet). Its aim was to calculate DRG rates that could be used both in transfer pricing and for benchmarking. This continues to be the main purpose for costing data, although increasing operational use of the information is an additional aim of the Ministry of Health.

In 2000, only three hospitals took part in the costing exercise, but by 2012 all public hospitals in the jurisdiction were voluntarily taking part - a result of concerted effort and dialogue by central administrators in discussing the benefits of costing. Although the same chart of accounts is used across all hospitals, prior to 2007 there had been considerable differences in the ways in which hospitals allocated indirect costs from similar cost pools. Since 2007, the focus has been on promoting use of best practice allocation methods and allocation keys across hospitals. The Nordic DRG system was introduced and adopted by Denmark in 1998. In 2002, Denmark introduced its own adjusted DRG system and it was this system that the costing guidance has developed alongside.

England
In 1996/1997, reference costs were introduced and are still mandatory for all hospitals. The methodology described in reference costing guidance is based on a top-down methodology. In 2002, payment by results, a DRG-based funding system, was introduced as the main funding regime. The English DRG system is in fact, based on healthcare resource groups (HRGs) that group patient episodes based on both diagnosis and procedure codes. With HRG prices based on average national costs, collected through a top-down reference cost collection, there was an increased focus on improving costing. At the same time, payment on the basis of activity, with a tariff for each HRG, led to greater interest in the unit costs per HRG at different providers and a specific interest in patient-level costing.

The Department of Health initiated the development of a bottom-up patient-level methodology that resulted in the adoption of patient-level costing and information systems (PLICS). Patient costing guidance – *Acute health clinical costing standards* – was initially based on Australian costing guidance. The guidance is not mandatory, but the Department of Health has recommended the adoption of patient-level costing and the use of the standards. In 2010, the Department asked the Healthcare Financial Management Association (HFMA) to continue the development of the standards. The idea was that the finance profession should take over the role in leading the development and maintenance of standards. A special interest costing group was set up within HFMA for this purpose.

During the same period, Monitor, a regulator in the healthcare sector, was encouraging providers to manage their service lines as autonomous business units. Both service line reporting (SLR) and service line management (SLM) involved understanding the profitability (or contribution to overheads) of different service lines and so required both an understanding of the income and costs of those service lines. Both PLICS and SLR/SLM are optional. Reference costs are mandatory. From 2014/2015, Monitor and NHS England will assume the responsibility for pricing, including the calculation of the NHS tariff. Monitor is looking at the possibility of basing the tariff calculation on PLICS data in the future.

Estonia
There is no compulsory costing guidance for Estonian healthcare providers to follow. However, indirectly the cost model underlying health insurance reimbursement prices has an impact on hospital costing systems.

The development of the Estonian Health Insurance Fund's (EHIF) cost model, to set reimbursement prices based on costs derived through an activity-based costing method, started in 2003. Four hospitals provide specialty-level cost data to feed this cost model and the EHIF use cost weights to produce DRG prices (initially Estonia used US cost weights, but since 2008 Estonia has been using its own cost weights).

The change was triggered by the growing demands of the Estonian Medical Association for salary increases in a situation where the salary component in healthcare service prices was not clear. The objectives for introducing the cost model were (a) to increase the transparency and fairness of healthcare service prices, and (b) to provide service providers with an incentive for cost management and development of internal costing systems.

EHIF initiated and was in charge of the process. Cost data from hospitals, observations of practice and service descriptions by medical professionals were used to feed the cost model. EHIF still owns and updates the cost model. Price list revision can be initiated by EHIF, medical associations or service providers. Applications for new prices or updating existing service prices need relevant cost information. EHIF asks for actual cost data from at least one hospital from each category of hospitals (regional, central, general).

A DRG-based payment system for inpatient services was introduced in 2004 (work on adapting the Nordic DRG system began in 2001 and was first used in a grouping tool in 2003). The initial goal for the DRG system was to increase productivity and efficiency (and curb inflation – the fee-for-service and per diem payment system had led

to large increases in average cost per case). Over time the DRG system has become a tool for benchmarking and analysis – since 2005, the EHIF has provided hospitals with regular comparative information. The national DRG cost weights are adjusted in accordance with the changes to the healthcare service prices.

France

The mandatory costing guidance is issued by the health minister. This guidance is mandatory for those hospitals who want to join the national database. The health ministry provides the costing methodology – the *Guide méthodologique de comptabilité analytique hospitalière* (*Methodological guide for hospital management accounting*) – the first version of which was issued in 1985. In 1997, hospital accounting reforms were introduced with another version of the guide. Since then several new editions have been issued (in 2004, 2007 and the latest in 2011).

Benchmarking was initially facilitated by a system known as the ISO point system. This was subsequently replaced by the current prospective payment system, a T2A activity-based tariff system. The costing guidance supports tariff-setting. Inspired by the US DRG system, France developed its own DRGs in the 1980s. The first French version was based on GHM (Groupes Homogènes de Malades) and was first released for use by hospitals in the 1990s. It has been adapted over the years, taking into account case severity, with each GHM being linked to several Groupes Homogènes de Séjour (GHS). This has increased the number of groups to about 2,300. Tariffs based on GHMs were introduced in 2004 and GHMs remain the main currency within the T2A system.

Alongside this costing approach, reforms were introduced requiring public hospitals to introduce service line management. At central level, reporting guidance was issued by the MEAH (Mission D'evaluation et d'Audit Hospitalier) for the first version in 2007 and by the ANAP (Agence Nationale D'Appui à la Performance des Etablissements Sanitaires et Medico-Sociaux) to support hospitals in service line management.

Germany

Clinical costing guidance was introduced with the Krankenhaus-Buchführungsverordnung (KHBV) in 1978. This regulation prescribed how hospitals should carry out financial and cost accounting and applied to all hospitals. The change in approach was linked with legislation on the financing of hospitals, the Krankenhausfinanzierungsgesetz (KHG). Only a few specific hospitals were excluded, such as prison or armed forces hospitals. The regulations also prescribed a detailed chart of accounts to be used by all hospitals along with mandatory rules for bookkeeping, balance sheets and profit and loss accounting.

The approach to cost accounting was also mandated, with cost pools defined based on the chart of accounts. This general costing guidance required cost centre accounting, but not cost accounting to the patient level. In 2000, a law was passed by parliament, mandating the introduction of a DRG-based hospital reimbursement system by the year 2003. The Association of German Hospitals, the Association of Sickness Funds, and the Association of Private Insurances agreed to create the Institutfür das Entgeltsystem im Krankenhaus (InEK GmbH), an organisation which would manage both the development of the DRG system and the clinical costing guidance.

More sophisticated costing guidance was needed to derive accurate DRG prices. The costing guidance prescribed by InEK (edited in the Kalkulationshandbuch and available on the internet) is based on the clinical costing guidance produced under the KHBV. However, it refines guidance for producing cost centre costs and sets out an approach to costing at the patient level. Since its introduction, the InEK costing guidance has been updated twice. KHBV costing guidance is mandatory for all hospitals. InEK costing guidance is mandatory for the hospitals included in the InEK cost data collection sample.

The InEK is financed by contributions from hospitals. In 2012, for each unit of activity, hospitals had to pay an additional €1.14, with about 18.5 million units of activity during the year. This income is split between hospitals in the sample and InEK as follows:

- Hospitals in the sample: 97 cents is used to finance the development of the DRG and the costing system at hospital level. Between €12,000 and €13,000 is paid to each hospital that has a successful submission as basic compensation for participating in the sample. In addition, each hospital receives €1.80-€2 per case. This allows the hospitals in the sample to finance, on average, approximately one whole-time equivalent costing practitioner.

- 17 cents is used to finance InEK. This allows the institute to employ about 40 staff.

Ireland

Following a recession in the mid-1980s in Ireland, which saw a reduction in hospital beds from about 18,000 to 13,500, a Commission on Health Funding (1989) was established and it recommended that 'techniques such as DRGs or other casemix costings should be used to determine the level of funding required for a specified level of service'.

The initial motivation for the introduction of DRG costing and casemix measurement was the ability to measure and compare hospitals' costs and activity across a peer group of hospitals, and to begin to allocate funding using this measure of efficiency. Initially 5% of the hospital budget was computed based on the casemix measurement system. This aimed to ensure that the actual financial adjustments would be low while the systems were being developed and while the hospitals were becoming accustomed to the concept of DRG-based funding and the information required for such a system. As the proportion of the hospital budget computed by reference to DRG costing increased, so did the financial adjustments and the motivation developed from one of benchmarking to resource allocation. Ireland is now at a stage of development in 2013 where DRGS form the basis of a prospectively

funded system of 'money following the patient', where hospital/hospital group budgets will be transparent and directly linked to the patients they actually treat.

The costing guidance has been developed and maintained by the National Casemix Programme (NCP) since 1991, when DRGs were also introduced. It was comprehensively updated in 1998 and is reviewed annually to ensure it remains in line with hospital practice.

The most important objective is that the guidance results in costs that are compatible with the cost weights used to compute DRG prices. Hence they are reviewed forensically whenever the DRG group changes, and there is ongoing consultation with Australian consultants to ensure the correct matching of Irish costs against the Australian weights used. The annual review of hospital costing files also ensures that any issues are identified and can be incorporated into updated guidance.

The guidance also aims to ensure that hospitals cannot 'dump' costs into unmeasured areas outside of casemix. This would have the effect of falsely resulting in lower unit costs. It is essential that robust costing guidance not only protects against this but also that a system of review and audit is in place. A further aim is to produce useful information for the participating hospitals, especially given the time and effort required to make a submission. As a result, the costing files were completely redesigned within the last five years and guidance was rewritten to reflect this.

Casemix coverage is being expanded. Initially only inpatient discharges were covered. Day cases were included soon after and more recently outpatients and emergency department attendances have come within the casemix measurement system (not part of the DRG system). With each of these changes guidance is updated.

The guidance is developed and maintained by the National Casemix Programme. Guidance for the current pilot patient-level costing (PLC) project, which began in 2012, is intended to be consistent with existing specialty-level costing guidance. The National Casemix Programme (NCP) regularly meets with external consultants to ensure that the PLC project uses similar costing guidance. The NCP is presently in the process of developing PLC guidance that will use the same underlying principles as the current costing guidance. This is to ensure consistency between PLC and specialty costing as not all hospitals will carry out PLC.

Italy

At a national and regional level, the DRG Medicare system started to be introduced in 1993. The initial motivation for the introduction of a DRG financing system for hospital activities was to stimulate efficiency. Maximum tariffs were set at a national level in 1995, using a sample of eight hospitals. Further updates of the tariffs were made according to changes in the DRG codes (and subsequent versions of the DRG system), and to changes in clinical activities by groups composed by all the Italian regions and other national institutions and agencies.

At the regional level, regions may adjust the tariffs for providers in their locality. The DRG system is actually used not only for financing purposes but also to measure clinical activities and evaluate performance by comparing tariffs and actual costs.

At the national level, the DRG Medicare system was introduced in 1993. Other than DRG level, costing guidance on different cost objects (excluding patients) exists at national and regional level. At national level, a guideline exists that is applied through the LA (level of assistance) model, established with the decree of 18 June 2004 of the minister of health. The model aims to collect the cost data coming from the income statements of hospitals according to 'levels of assistance' of each region.

The 'levels of assistance' represent the typologies of services guaranteed and covered by the National Health System and were defined by the decree of the president of the board of ministers (29 November 2001). The three macro levels of assistance are 'health collective environment of life and work' (prevention), 'primary care' and 'hospital'. These levels are further subdivided in detailed levels of assistance. The collected cost data are the basis, on a regional and national level, for the formulation of indicators representing the cost of the essential levels of assistance. The decree of 18 June 2004 from the minister of health does not define the cost allocation drivers among the levels of assistance.

At a regional level (Tuscany region), in 1999, decree no. 718 of 23 June established a regional cost observatory, with the aim of collecting cost information from healthcare organisations. The aim was to support regional health policies and make a benchmarking process possible among healthcare organisations based on uniform cost information. On that occasion, a first version of guidance supporting the calculation of costs by cost centres in health organisations was published. Updated versions have been released in 2000 and in 2004. Patient costing is not covered in this, nor in the following versions of the manual.

In 2005, the observatory stopped its activity and was suspended until 2011. At this point, a regional cost laboratory was established to revise the guidance and reactivate cost collection from health organisations using a uniform set of rules. The project aims to build a regional system able to collect information on costs (at cost centre level) of the healthcare organisations. The new version of the manual was issued by decree no.555 on 25 June.

The Netherlands

The main purpose for the introduction of the DRG system in the Netherlands in 2005 was to reform hospital payments to facilitate negotiations (in particular on quality) between purchasers and providers by defining the products of hospitals – DBCs: diagnose behandeling combinatie (diagnosis treatment combinations). The original motivation was a blend of payment/resource allocation, public accountability and (particularly in recent years) benchmarking.

Since its implementation, the DBC system was considered too

complex. The level of detail was so high that 100,000 different DBCs could be constructed. However, only 30,000 of them were used in practice, with only 3,000 DBCs accounting for 90% of all costs. As a result of the critical assessment of the original DBC system, a new project was initiated in 2007/08 called DOT (*DBCs on their way to transparency*), to be implemented by 2012 with three major and interdependent changes:

- The care products are assigned from registered activities by a web-based grouper instead of being selected by the medical specialist and then validated.

- The number of DBCs are reduced to about 3,000 DBC care products. DBCs are clustered in product groups that consist of decision trees, which all belong to the same specialty and are cost (yet not medically) homogeneous.

- The classification of the DBC care products are based on the uniform ICD-10 chapters, making international exchange of data possible.

All interested parties, including the medical societies, were closely involved in designing the original DBC system in 2005. A new and independent organisation (DBC-Onderhoud) was created with the specific task to develop and maintain the DBC system. The Dutch Healthcare Authority (NZa) monitors whether the DBC system serves public interests such as transparency, an efficiently functioning healthcare market and quality of care.

The NZa aims to determine DBC tariffs in the regulated market, based on actual unit costs. Since the NZa needs comparable unit cost information, healthcare providers are asked to determine their DBC unit costs according to the same principles. The NZa does not prescribe a unique costing model, but rather a model with different degrees of freedom depending on the characteristics of the healthcare provider.

The first costing guidance in hospitals was introduced by the NZa in 2003 and comprised a document called *Model Kostprijzen DBC 2003*. This document was published before the introduction of DBCs in 2005 and contained a unit cost model for hospitals. The unit cost model 2003 formed the basis of the subsequent guideline, *Document calculatieprincipes veranwoordingskostprijs,* which was introduced in 2006.

The most recent guidance, introduced in 2012, is described in *Kostprijsmodel zorgproducten medisch specialistische zorg*. This document contains a costing model that the NZa prescribes in order to determine unit costs of DBCs in medical specialist care. The Healthcare Insurance Board (CVZ) further published a manual in 2010 for cost efficiency analysis across healthcare providers. This manual is mainly developed for researchers and contains methods and standard unit costs that can be used to perform economic evaluations. Finally, in 2011, Bureau HHM published a guideline called *Handreiking Kostprijsberekening,* covering long-term healthcare services providers.

Portugal

Since 1982, there has been legislation in place concerning the monetary flows in public administration institutions. In 1990, a law concerning the basis of public accountancy was published (*Law 8/1990,* 20 February) which was applicable to hospitals. In 1997, the Official Plan of Public Accountancy (*Law-Decree 232/97,* 3 September) was published, bringing together different aspects of accountancy.

In 2000, the *Official plan of accounts for the Ministry of Health* (*Portaria 898/2000*, 28 September) was published. The reason behind the legislation in this area was to harmonise regulations for the public sector and public administration. It was acknowledged that there was a need for comparable information and accurate reporting. Simultaneously, there was interest in having better grounds for comparisons with the private sector. Accurate information regarding costs has become more and more important over time and most of the changes since 1982 have aimed to provide greater transparency and ease of understanding in the cost and financial information being published.

Quebec

In Quebec, the first version of DRGs was implemented in 1987. The current version, called APR-DRG, was implemented in 1995. Since 2003, hospitals have received their funding through global budgets, based primarily on the amounts of expenditure incurred in the past. Spending increases each year have reflected the rising costs of labour, drug prices, technologies and medical supplies. The APR-DRG was introduced to allocate development budgets and budgets for the surgery access programme (which only concerns volumes of additional surgery compared with the reference year 2002/03).

Bottom-up patient-level costing is undertaken by 21 hospitals that have outsourced their cost accounting. MédiaMed Technologies developed software called Med-GPS. This accounting system analyses the technical and financial data from the hospital and calculates the cost for each patient. The government, particularly the Ministry of Health, has shown a keen interest in this system. The number of hospitals adopting this accounting technology has risen recently from 14 to 21.

On financial accounting, there is regional regulation prescribing how to report the annual accounts – the AS-471 form is the annual financial report required by section 295 of the Act on Health Services and Social Services (RSQ, cS-4.2). The financial accounting regulation has existed for over 30 years.

Appendix B

Table 6: Approaches to sampling of provider organisations

Countries	Sample number of hospitals (%)	Total number of hospitals	Expenditure of hospitals in sample (%)	Total expenditure of hospitals
Denmark	44 (100%)	44	About €6.8bn (2013)	About €6.8bn (2013)
England	All NHS hospitals (100%)	245	N/A	N/A
Estonia	4 (21%)	19	€249m (in 2010 total cost based on financial statements) (55%)	€448m (in 2010 total cost based on financial statements)
France	69 (3%)	2710	€7.4bn (9%)	€81.5bn
Germany	249 in 2012 (16%)	About 1,600	Sample hospitals account for 22% of all cases. Assuming casemix is same as in all hospitals, they would have earned about €13bn	All spending about €80bn; DRG based about €55b (2)
Ireland	39 (67%)	58	€4.6bn (90%)	€5.1b
Italy, national level	8 (those with the **most** advanced accounting systems)	870 public, 587 private (2011)	–	Total cost €112bn (2011)
Italy, regional level (Tuscany)	All hospitals involved (100%)	54 public, 32 private	–	Total cost €7,111m (2011)
Netherlands	13-23 (14-25%)	94	N/A	€23,590m
Portugal	All NHS (100%)	About 60	100%	100%
Quebec	88 (100%)	88	About $2.4m	ca. $2.4m

	Selection criteria	Development of sample size over time	Voluntary/mandatory participation in sample	Representation of public/private hospitals in sample	General issues/problems with representation
	N/A	3 in 2000 to 44 in 2011	Voluntary	All public	N/A
	N/A	N/A	Mandatory	Public only	N/A
	At least one regional, central, general hospital	No changes to sample	Participation based on long-standing agreement	Public only	N/A
	No official criteria	–	Voluntary with small financing incentive	47 public, 22 private	N/A
	No official criteria	Increased from 125 (2001) to 249 (2006). Remained srable since then	Voluntary	Public and private	Under-representation of small hospitals(<100 beds); overrep of hospitals with >300 beds; under-rep of private-for-profit hospitals (less than 10% in sample but more than 25% of all hospitals)
	>2,000 discharges	1991: 15, 2012: 39	Mandatory	All public	None
	All hospitals able to provide cost data	–	Mandatory for all hospitals (public and private)	All public	–
	–	Sample always been the same	Mandatory	All private hospitals involved	–
	Voluntary participation, different samples per type of hospital	Sample size general hospitals: 2005: 13 2007: 16 2008: 20 2009: 23 2010: 13 (including academic hospitals)	Voluntary	100% non-profit, privately owned	Increasing representativeness but still no mandatory participation, thus possible bias because of voluntary participation
	N/A	–	Mandatory	Only NHS	–
	N/A	–	Mandatory	Only public	–

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