

## EDITORIAL

VARIABILITY IN HEALTHCARE TREATMENT COSTS  
AMONGST NINE EU COUNTRIES – RESULTS FROM  
THE *HEALTHBASKET* PROJECTREINHARD BUSSE<sup>a,\*</sup>, JONAS SCHREYÖGG<sup>a</sup> and PETER C. SMITH<sup>b</sup><sup>a</sup>*Department of Health Care Management, Berlin University of Technology, Berlin, Germany*<sup>b</sup>*Centre for Health Economics, University of York, York, UK*

## BACKGROUND

Patient mobility gives rise to some fundamental information requirements, such as the nature of the basket of services offered in the different Member States, how these are defined, how often they are used for particular patients, what their costs are, what prices are paid for them, the quality with which they are delivered, and their cost-effectiveness. This knowledge will enable both Member States and the European Commission to formulate coherent policies on patient mobility in a way that will preserve both the financial viability of existing health systems and the treasured principles of universality, equity and accessibility. Further, if patients are to benefit from the opportunity offered by the European Union's emerging healthcare market, they too will need to know the nature, quality and costs of services available elsewhere. Finally, international comparison based on good quality data is an important tool for learning from best practice within and between countries.

However, international comparisons of service, cost and quality data are currently not routinely available for individual treatments. Up to now, healthcare cost comparisons have been usually made at an aggregate level and variations have been identified at the macro-level, e.g. in purchasing power parities (PPPs) per capita, as a percentage of GDP, distribution of expenditure per sector. Most fundamentally, analysis of international variation in the costs of individual services at the micro-level is difficult because of manifest limitations in the comparability of data. As a result, where cost data for individual treatments have become available, it has usually been unclear whether differences are due to (1) differences in the actual type of service delivered, e.g. in the technologies chosen or the human resources skills mix employed, (2) the intensity with which technologies or personnel are used per treatment episode (e.g. treatment time and length of stay), and (3) differences in input costs (e.g. costs of implant and hourly costs of personnel).

The delivery of a seemingly identical service might vary across countries due to variations in (1) the definition of the start and end of a service (e.g. whether rehabilitation following a hip replacement is part of the hospital treatment or seen as a separate service with its own tariff); (2) the technology used (especially regarding the use of innovative and/or expensive technologies, e.g. cemented hip replacement vs costlier uncemented hip replacement); and (3) the accounting treatment of associated services (e.g.

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whether anaesthesia is included in the service ‘surgical procedure’ or counted and charged separately). Even for a comparable service, different factors might be included in the cost and/or price calculations (e.g. how overheads are treated, whether volume variable, ‘fixed’, amortisation or investment costs are included, or whether any available subsidies (e.g. from local authorities) are made explicit). Any observed variations in costs or prices might then be explained through the differences in accounting treatments. Finally, an important source of variation within Europe is the variation in input prices, especially workforce pay (e.g. doctor and nursing time), which differs significantly across borders. The analytic challenge is to make all these information available, so that one can then explore the underlying reasons for treatment and cost variations, and ultimately to determine whether differences in inputs and processes translate into differences in outcomes.

It is against this background that, in the policy-oriented research area within its sixth Framework Research Programme, the European Commission focused, inter alia, on ‘the formulation of a more coherent overall policy vision with a clear evidence base [...] to respond to the new challenges for enlargement and to find effective responses to issues related to [...] the increasing mobility of patients [...] and services’. Specifically, it called for a project to address the task of ‘Comparing Member States’ health costs at individual service level’ which was defined as ‘to identify possible methodologies for comparing costs of services, and to scope the possibility of the future development of detailed systems of health cost auditing and accounting in order to move towards better cost-effective healthcare systems’.

### OBJECTIVES

The *HealthBASKET* project was therefore funded to address both the policy and methodological challenges associated with cross-border cost variations. It first focused on the basket of services offered by nine EU member states; secondly, it reviewed and developed methodologies to assess the costs and prices of individual services across those states, and thirdly it developed and tested an innovative approach towards collecting and analysing cost variations at the micro-level for the purposes of international comparison. A selection of inpatient and outpatient ‘case vignettes’ served as the basis for assessing and explaining cost variations both between- and within-member states.

The nine project partners comprised Denmark, England, France, Germany, Hungary, Italy, The Netherlands, Poland, and Spain. They formed a sample of EU Member States representing the various types of healthcare systems as well as ‘old’ and ‘new’ membership status. Each of the partners:

- collected and described the definitions of the services provided within the system and analysed the structure and the contents of the benefit ‘baskets’ (and, if existing, the ‘catalogues’ in which the baskets are operationalised) as well as the process of defining these benefit baskets and catalogues (for results see Busse and Schreyögg, 2005);
- reviewed methodologies used to assess costs and prices of services included in the baskets across countries (for results on hospital case payment systems see Busse *et al.*, 2006) and attempted to identify ‘best practice’ in the analysis of costs at the micro-level with the scope of international comparability;
- assessed variation in resource consumption (human resources, goods, capital, etc.) and actual costs of these resources for individual health services between and within countries, using a selection of 10 ‘case-vignettes’ representing need for care in both inpatient and outpatient settings.

This issue of the journal reports the results from the third project phase. The objectives were to:

- identify and develop a methodology for cost comparison;

- assess whether prices are a good estimate of the costs of individual services;
- explore the reasons underlying variations in the costs of individual services.

### METHODOLOGY – THE CASE VIGNETTE APPROACH

A fundamental requirement of international cost and price comparison is mutually accepted methodological guidance (in the form of a standard costing method) that is both feasible and can secure reasonably good compliance. However, a universally accepted costing methodology does currently not exist in the healthcare sector. There are several appropriate methods to estimate the (unit) costs of a particular service (Mogyorosy and Smith, 2005). In general, accountants define costs in terms of the historic or current historical value of economic resources, while economists tend to use a concept of costs based on opportunity cost. Accountancy and economic literature nevertheless agree on the basic principles of costing. A costing exercise starts with (1) the formation of a well-defined decision problem, including the objectives of this particular costing, the perspective of costing, and the time horizon (vital in deciding which costs are effectively output variable, and which costs are ‘fixed’), as well as (2) the description of a particular service (cost object). Once a service has been defined in detail, the methodologies for its costing follow several distinctive steps: (1) the identification of resources used to deliver the service; (2) the measurement of resource utilization in natural units, typically the elements that are ‘variable’ in the context of the identified decision; (3) attaching monetary value to resource use; and (4) considering wider issues such as the opportunity cost of capital, amortisation, taxation, etc.

In recent years, a number of approaches have been tested for cross-country cost comparisons at a greater level of detail than the traditional aggregate level. At the provider level, several studies measuring hospital performance among hospitals from different countries have been conducted (Mobley and Magnussen, 1998; Steinmann *et al.*, 2004; Linna *et al.*, 2006). However, the main problem with studies at the hospital level is that they usually cannot control adequately for differences in case mix. An episode-specific approach might therefore be a better alternative. This approach is based on the assumption that data pertaining to specific health conditions will illuminate interconnected aspects (i.e. financing and utilization of medical technologies) responsible for health systems performance (Häkkinen and Joumard, 2007).

Recently, a number of approaches for comparing costs and outcomes for specific diseases or care episodes have been developed such as the McKinsey study (McKinsey Global Institute, 1996; Garber, 2003), the OECD ageing-related disease (ARD) project (Moise, 2003; Moon, 2003; Hughes, 2003) and the Technological Change in Health Care (TECH) Global Research Network (McClellan *et al.*, 1999; McClellan and Kessler, 2002). The McKinsey study gathered data on four diseases relating to three countries at aggregate national level from secondary sources such as literature reviews. The OECD ARD project explored the availability of necessary and comparable information on three diseases in OECD countries, but also did not gather any primary micro-level data. The TECH network study has been the first to collect micro-level data from a number of countries. The project was able to obtain data on utilization, co-morbidity, mortality and demographic characteristics for patients with acute myocardial infarction (AMI) from seven countries. However, the main emphasis of this project has been to document technological change rather than focussing on costs and the related institutional characteristics.

In the absence of both a harmonisation in routine data and an accepted scientific methodology, the *HealthBASKET* project developed, tested and used a novel approach termed ‘case vignettes’ to explore resource use and costs, as well as prices. This approach overcomes many of the methodological difficulties otherwise encountered. The case vignettes depicted ‘typical’ patients, including specified age, gender, and relevant co-morbidity. Vignettes were developed for both inpatient and outpatient, primary and secondary, elective and emergency settings (Box I).

## Box I. Overview of the 10 vignettes

Vignette 1	Appendectomy; male aged 14–25; inpatient; emergency (cf. Schreyögg, 2008)
Vignette 2	Normal delivery; female aged 25–34; inpatient; elective (cf. Bellanger and Or, 2008)
Vignette 3	Hip replacement; female aged 65–75; inpatient; elective (cf. Stargardt, 2008)
Vignette 4	Cataract; male aged 70–75; outpatient; elective (cf. Fattore and Torbica, 2008)
Vignette 5	Stroke; female aged 60–70; inpatient; emergency (cf. Epstein <i>et al.</i> , 2008)
Vignette 6	Acute myocardial infarction; male aged 50–60; inpatient; emergency (cf. Tiemann, 2008)
Vignette 7	Cough; male aged ~2; outpatient; emergency
Vignette 8	Colonoscopy; male aged 55–70; outpatient; elective
Vignette 9	Tooth filling; child aged ~12; outpatient; emergency (cf. Tan <i>et al.</i> , 2008)
Vignette 10	Physiotherapy; male aged 25–35; outpatient; elective

A questionnaire was developed, to allow accurate documentation of the services that a patient similar to the one described in the vignette would have received, as well as the costs associated with the services provided.

For each country, data were collected from a sample of healthcare providers relevant to the case vignettes (i.e. hospitals, dentists, GPs, physiotherapists). For inpatient case vignettes, we asked researchers to exclude atypical providers – those with cost structures that would be expected to differ from those normally providing the service (e.g. tertiary care hospitals, if the service is provided mainly in general hospitals).

Researchers collected data in collaboration with hospital (or other provider) staff, to avoid delays of submitted cost data and calculation errors. Cost data were obtained from hospital accounting departments. Clinicians were asked where possible to provide utilization data for each vignette on the last 10 patients cared for in their institution. Where this was not feasible, regional or national administrative databases covering more than 10 patients were used. No personalized data of actual patients were needed or collected. Whichever approach was adopted, the validity of the analysis required that each patient fit the indications described in the case vignettes, in order to ensure that case mixes were comparable.

A detailed description of the methods that were to be used to estimate labour costs was developed. Personnel costs should include time spent directly with the respective case per day *and* the cost of time not directly spent with the respective case per day (and were allocated to it proportionally), e.g. staff assemblies, studying documents. It was agreed that, where possible, national wage rates (or national average wage rates) should be used. All countries were to report costs and prices for the year 2005. For each country where Euros are not the currency of use, costs were converted to Euros using the mean exchange rate for 2005.

The use of this methodology proved to be feasible, well accepted, and relatively low cost in terms of research effort. We believe it led to realistic and valid results. While it ‘standardises’ patients – thereby avoiding the necessity to risk adjust – it is sensitive to differences in treatment patterns and can be used for cross-provider and cross-country comparisons. The method chosen represents a good triangulation between qualitative and quantitative methods and constitutes an efficient approach both for European collaborative projects as well as within-country comparisons.

The approach has, however, some methodological limitations. First, the simple vignettes cannot reflect the clinical reality with complete accuracy. Furthermore, relatively small samples of both providers and patients recruited lead to quite large confidence intervals for the estimates in some countries. Countries, and providers within countries, differed in their ability to provide data according to the required methodology. Some structural differences between countries were identified. For

example, hospital providers in some countries do not own their assets, and international accounting standards regarding the cost of capital have not always been fully implemented. Administrative differences between countries included: legal barriers to accessing patient data (especially in the UK); variation in the willingness to disclose data; variation in the quality of information systems between countries and providers; variation in the number of providers contributing data to each vignette in each country and the numbers of patients sampled by each provider; differences in the accounting rules used to allocate indirect and overhead costs to services.

## RESULTS

The comparison of cost components by vignette found that for most vignettes, the total cost of care in Hungary, Poland, and Spain were – as expected – below the nine-country average. However, after adjustment for episode-specific PPPs (Schreyögg *et al.*, 2008), costs of these three countries turned out to be average, or even among the highest for some vignettes. This suggests that low wage level explain low costs seen in some southern and eastern European countries.

The prices that were charged varied greatly, not least because of variation in applied technologies. The hip replacement vignette, for example, was reimbursed at a (average) level of €8963 in Italy, compared with €1795 in Hungary (Stargardt, 2008). The AMI vignette showed some remarkable variations as well. In the Netherlands, the ‘price’ for an AMI treatment was €8722, whereas in neighbouring Germany, it was ‘only’ €3114 (Tiemann, 2008).

The analysis of the correlation between prices (reimbursement) and costs showed that for *normal delivery*, *stroke*, and *colonoscopy*, prices and costs matched fairly well on average, although there are outliers. For *appendectomy*, *hip replacement*, *cataract*, and *AMI*, prices were on average higher than costs which may very well be due to the fact that the case vignettes were built around patients with no complications. For *tooth filling* prices seem on average to be lower than costs. There were insufficient data to allow a comparison of costs and prices for *cough* and *physiotherapy*.

Overall, while differences in average reimbursement levels were significant between countries, within-country variation was also unexpectedly large – in some cases, larger than between-country variation. This was particularly evident after adjustment for PPP (cf. data in Schreyögg *et al.*, 2008). These differences are partly due to different accountancy standards, but also due to prices per input unit and, most importantly, due to large and apparently real differences in practice.

Table I shows that the reason for variation which proved to be significant most often was the use of particular technologies or procedures, specifically in all but one of the seven care vignettes explored in detail in this volume. The only exception was *normal delivery* where the vignette description standardised the procedure due to the exclusion of Caesarean section. Use of technologies, especially those which are innovative or ‘expensive’, therefore proved to be an explanatory variable as relevant as PPP – with the exact source of variation depending on the case vignette.

Structural variables such as the number of beds per hospital, staff per beds, beds in the relevant specialty, or staff in the relevant specialty proved to be a significant factor only in exceptional cases. Differences in treatment setting were significant only for *cataract* and *colonoscopy* (data not shown).

Process-related variables such as length of stay or treatment time were often statistically significant, but were not in general major influences on cost variations. Overheads as a proportion of total cost varied widely both between countries and between vignettes, suggesting considerable scope for more uniformity in accounting approaches. Differences in staff costs per unit of time significantly explained international variations only for the *delivery* and *tooth filling* episodes.

Table I. Sources of variability in healthcare costs of seven vignettes

	Hip replacement	Stroke	Acute myocardial infarction	Delivery	Appendectomy	Cataract	Tooth filling
<i>Structures</i>							
Beds/hospital	*					**	
Nurses/bed					<sup>a</sup>		
Urbanity			*				
Setting							
<i>Technology/procedure</i>							
Processes	Non-cemented vs cemented <sup>***</sup>	Percentage of thrombolysis*	Percentage of PTCA with stenting <sup>**</sup>		Laparoscopic vs open surgery <sup>**</sup>	Soft vs hard lens <sup>***</sup>	Percentage with imaging <sup>***</sup>
Personnel input (time)		*	**	**		*	Treatment time <sup>**</sup>
Length of stay				Nurses only <sup>**</sup>		***	<sup>b</sup>
<i>Cost of personnel/hour</i>							
<i>Purchasing power parities (PPP)</i>	***	<sup>b</sup>	***		***		

\*Significant at 0.05 level; \*\*Significant at 0.01 level; \*\*\*Significant at 0.001 level.

<sup>a</sup> Only in one model.

<sup>b</sup> PPP not used as explanatory variable but to adjust costs as dependent variable.



## CONCLUSIONS AND RECOMMENDATIONS

Our approach to use standardised case vignettes to explore resource use as well as costs proved to be feasible and relatively low cost. It overcomes many of the methodological difficulties encountered using other approaches. In the near future, the system of case vignettes should in our view be further explored. This work might include an extension to trans-sectoral episodes of care (e.g. acute care and rehabilitation), episodes of chronic care (such as in disease management programmes), and extending the comparison to quality of care. There is also a scope for addressing methodological issues, such as making the allocation of overhead costs more comparable, and constructing healthcare-specific PPPs as explored by Schreyögg *et al.* (2008) in this volume.

A prerequisite for international cost comparison on a broader and more representative base is the existence of universally accepted methodological guidance for routine data assembly (a standard costing method), comparable accounting and analytic approaches, and reasonably good compliance. Yet this harmonisation of costing methodologies raises a serious dilemma. While delivering important benefits across European healthcare, enforcing a standardised ‘European’ accounting methodology might appear to conflict with the principle of subsidiarity (as standards always do). The paradox is that decentralised political regulation and operational management systems might in fact require more uniform data in order to operate effectively.

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## CONFLICT OF INTEREST

No conflicts of interest declared

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