

The Quest for NHS Efficiency

Use of patient-level costing to increase efficiency in NHS trusts

Research report

Ian Blunt and Martin Bardsley

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Summary

The need to extract greater value from funds spent on health care means that there is increasing availability and scrutiny of data on the costs and outcomes of care. This study analyses new computerised information systems in hospitals which have been set up to track and enable analysis of the costs of care incurred by individual patients. Such patient-level costing systems were introduced in the National Health Service (NHS) in the mid-2000s.

Relatively few trusts have these information systems tracking the costs incurred by individual patients; most trusts collect such information in aggregate across different specialties or 'service lines'. Information on the costs of individual patients provides a much more detailed understanding of the real costs of the care incurred, enabling management decisions to be more informed. Furthermore, it has the potential to engage clinicians by making clearer the link between clinical decisions about care with aspects of efficiency and cost-effectiveness.

As the NHS faces the challenge to achieve major efficiency savings, the objective of this study was to examine whether the implementation of information systems for patient-level costing might lead to greater efficiencies. Specifically, it examined how trusts are using and planning to use patient-level costing systems by drawing on the experiences of several early adopters and empirical analyses of data from one trust.

Key points

- Patient-level costing was introduced in NHS trusts in the mid-2000s. By 2010 nearly one-third of NHS trusts had patient-level information and costing systems (PLICS) and by 2011 half of trusts had these systems. When implemented well, PLICS provide a vast array of useful and accurate data on spending per case against income. This is far more detailed and accurate than traditional methods of costing care in hospitals that use cost apportionment, such as across Healthcare Resource Groups (HRGs), specialty or consultant teams.
- Analysis of patient-level costs from one trust showed considerable variation in cost relative to income for groups of patients within an HRG and between consultant teams. Only 17 per cent of tariff-chargeable cases incurred costs that were close (within 10 per cent) to the tariff price; 83 per cent incurred costs considerably different (greater than 10 per cent) to the tariff price. The more consultants providing treatment per HRG, the wider the variation in costs. To make



efficiencies, clearly a ripe place for scrutiny will be those cases costing more than the tariff price.

- Without patient-level costing the reasons for such variations, and thus how efficiencies may be made appropriately, will not be clear to the trust, specialty or consultant team.
- The evidence to date shows modest efficiencies made following the introduction of PLICS, but this may be because the systems are not yet used to their full potential. Benefits from these systems appear to depend as much on surrounding managerial support as on the better availability of information.

The reforms proposed in the Health and Social Care Bill, coupled with the current real-terms budget freeze for the NHS, might be expected to encourage the wider use of patient-level costing systems as trusts become more vulnerable to financial failure. In turn, better information on the costs of care may help improve the tariff prices set nationally by Monitor in its new role as economic regulator.



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1 Introduction

Any organisation wanting to become more efficient requires a sound understanding of both its costs and income. Patient-level costing is one of the most sophisticated ways that a health care provider can understand its costs. Patient-level information and costing systems (PLICS) derive costs from identifying the resources used by individual patients in a way that can span across different departments.

While patient-level costing is well established in some other countries, it is still young in the National Health Service (NHS). The approach has been encouraged by Department of Health and Monitor (Department of Health, 2009) as tool to search for efficiency savings, finding £20 billion of savings by 2014 (Nicholson, 2009). Until recently, the monitoring of financial information in the NHS has been structured around income and expenditure flows at organisation level. Typically these have been coded to the detail required to identify individual payments or income streams (a 'top-down' cost calculation method). This means that the organisation knows how much was spent and who has been paid, but it is hard to break down those aggregate figures to estimate the relative costs of different services. To look in detail at costs requires a series of approximations that bring into question the validity of the cost information. PLICS systems aim to overcome this by using much more detailed underlying information to estimate costs.

This study explored the extent to which PLICS is used in the NHS, and the potential of such systems to increase efficiency. It used a combination of one year of real PLICS data from a major teaching hospital with the information on the experiences of other trusts that are introducing PLICS. The study's aim was to describe the potential for detecting efficiency savings through PLICS, and to discuss some of the implementation issues faced by early adopters.

1.1 The origins of patient-level costing

A cost accounting system should accomplish three goals:

- 1) promote cost efficiency;
- 2) allow the organisation to maximise its use of resources by managing the services that it offers its patients; and
- 3) highlight opportunities for continuous improvement of operations.

It has been argued that traditional costing systems used by health care organisations fail to meet these objectives (Lawson, 2005).

Patient-level costing has its roots in the doctrine of activity-based costing (ABC), which developed in the US manufacturing sector during the 1970s and 1980s (Staubus, 1971). It identifies the activities in an organisation and assigns the resources used by each activity to all products and services that depend on that activity, according to the extent that the product uses the activity. In this way, the aim is to reduce the proportion of costs treated as overheads and maximise the proportion of costs treated as direct costs.

In the health care setting, many costs will be directly attributable to the patient (for example, drugs prescribed, cost of prosthetics, and so on). Other costs will require an

element of apportionment (for example, ward costs, staff time), which may be based on basic rules such as a crude *per diem* rate based on ward use. In PLICS systems the key is linking utilisation data to cost data at the patient level, which then can be aggregated into ‘activities’ that contribute to the final outcome of the whole production: patient care. In PLICS the patient is the fundamental unit around which costs are collected, as opposed to top-down models that work to department or cost centre. This allows the cost of activities to be constructed even when they span across multiple departments.

There is debate over the extent to which ABC really does improve organisational performance in industrial settings. One recent study found that the extent of ABC use was significantly and positively associated with improvements in quality, and that this had a significant positive impact on cost improvement and profitability (Maiga and Jacobs, 2008). Other studies found no evidence to support this view, but found that ABC use had no significant association with return on assets (Ittner and others, 2002); and ABC was shown to have a significant indirect effect on performance that was mediated through its support for advanced manufacturing capabilities (Banker and others, 2008). The message appears to be that ABC may provide direct improvements in efficiency, but its main impact comes through supporting the organisation’s management.

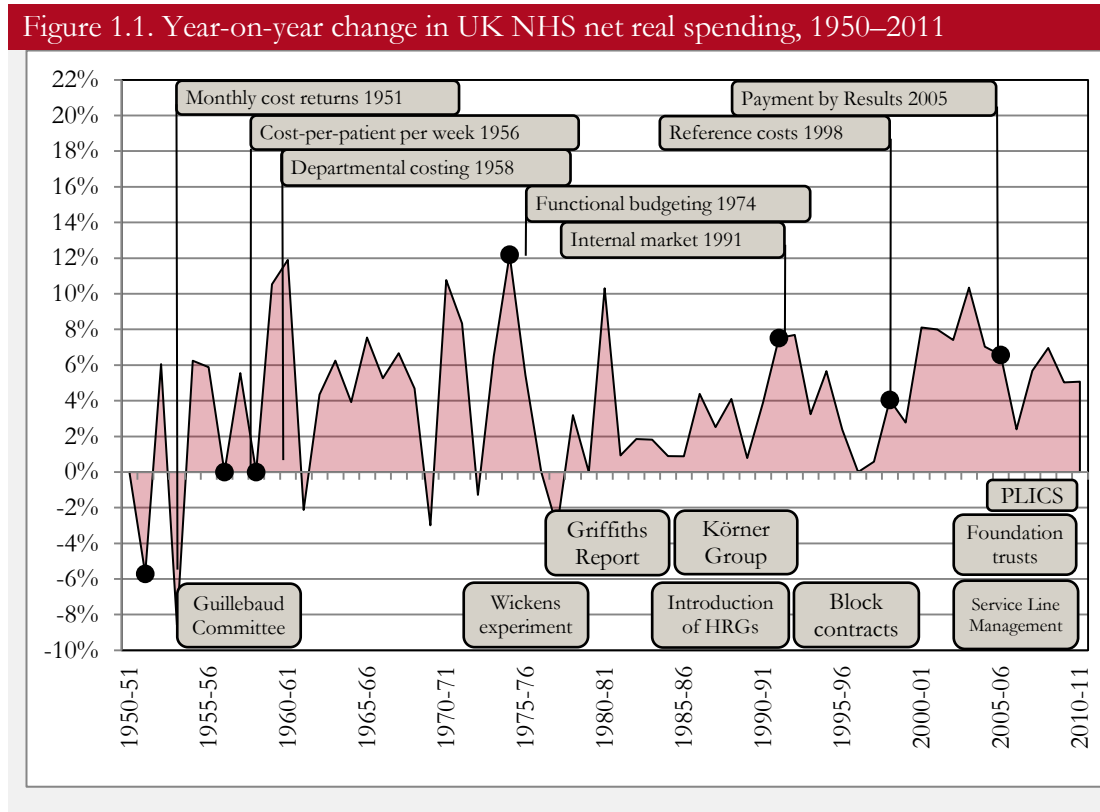
1.2 History of monitoring costs in the English NHS

Interest in the costing mechanism used in British hospitals pre-dates the NHS. As early as 1893 Sir Henry Burdett published a Uniform System of Accounts, which itemised expenditure by type: for example, provision costs (food, drink), drugs and nurses’ wages. This financial and statistical data was combined to provide unit cost information, most importantly ‘average cost-per-bed occupied’, and was published annually for most large hospitals in the UK (Burdett, 1901).

The evolution of PLICS was more likely in countries that needed billing systems to invoice patients. A billing system inevitably means that a hospital will have to record the items of expenditure for which they charge. However, in the absence of this requirement the NHS saw a slower development of its costing systems (Figure 1.1). The state-of-the-art costing system in 1951 was monthly cost returns, which meant that hospital management groups could highlight expenditure against budget on a number of summary headings such as salaries, provisions, uniforms, drugs and dressings (Ridgen, 1983).

In 1956 the Guillebaud Committee (Abel-Smith and Titmuss, 1956) presented the first audit of costs in the NHS, which represented a turning point in thinking about how much should be spent on health services (Rivett, n.d.). The committee’s main finding was that when adjusting for inflation, costs were not rising as alarmingly as feared. Also importantly, it required the monitoring of generic costs per patient-week by the Ministry of Health.

Many commentators argued for greater granularity of cost returns, including a 1952 report by the Nuffield Trust (Nuffield Provisional Hospital Trust, 1952). It was proposed that department costs could be used as a benchmark to compare performance. In 1958 annual departmental costing was introduced, with comparative information produced for each regional health board (Robson, 2003). These costing systems were not significantly adjusted until 1974 with the arrival of functional



Note: Annotated with major costing reforms and trends (real spend data from (5)).

budgeting (Cook, 1995), which grouped costs into functional categories (for example, nursing, pathology and catering) and were implemented across groups of hospitals.

Around this time an interesting local experiment began in 1973/74 when Westminster Hospital developed specialist costing systems and clinical budgeting. These purposely sought to give clinicians responsibility for their budgets (Wickings and others, 1983). Early trials had shown that merely giving doctors financial information did not alter their behaviour, but when clinicians controlled the expenditure, for example the replacement of equipment, they might make savings that could be used for better purposes.

Through the 1970s it became clear that systems that linked activity and costs were required to support these approaches to management or clinical budgeting. At that time little was known about the costs of individual treatments beyond the limited findings in specific research projects. In 1979 the Financial Information Project was established to examine the need for financial information for health planning and for clinicians in the management and organisation of their units. The project concluded that costing at the level of the individual patient would be needed, but was likely to be prohibitively expensive (Rivett, n.d.).

The 1980s saw a rapid expansion in information technology (IT), which was essential for costing and reporting. Some pilot studies, such as clinical budgeting, explicitly aimed to better link information about resource use with clinical decision-making and responsibilities. There were also a number of reviews and initiatives, such as the Griffiths Report, Körner's Steering Group on Health Services Information, Specialty

Costing and the Resource Management initiatives (Rivett, n.d.). Although all these required major changes in the depth and quality of financial information, the gains were at best marginal rather than a revolution in NHS costing. It is also significant that this was a time when computerised information systems became the norm and micro-computer-based applications made new forms of data analysis possible.

With the coming of the internal market in the early 1990s, hospitals needed new forms of financial information for contracting and business planning. However, the necessary systems required to compare relative costs were not in place. Many hospitals had a limited understanding of what drove their costs (or what their prices should be), and the use of block contracts using notional costs was common (Laurence, 1991). In the 1990s there was a renewed effort to cost clinical activity linked to more sophisticated approaches for describing case mix: originally the imported Diagnosis-Related Groups (DRGs), but eventually the English variant of Healthcare Resource Groups (HRGs) (Bardsley and others, 1987). These are groups of patient events that share broadly similar diagnoses and have been judged to consume a similar level of resource.

To cost a DRG or HRG with any accuracy requires information about the inputs received by patients within that group. In the absence of patient-level information, such costs have to be based on indirect costs and assumptions. Standard HRG costs by hospital trust eventually arrived in 1998 with National Reference Costs (Department of Health, n.d.). While the NHS Costing Manual sought to bring a greater degree of consistency to producing cost information, often the resulting reference costs, although useful in some ways, are felt to be inaccurate. A recent report by the Audit Commission found that 'poor opinion is limiting the use and organisations see few incentives to improve the quality of their data' (2010, p. 5). The reference costs are used in the calculation of the national tariff as well as in efficiency benchmarking by the Reference Cost Index (Department of Health, n.d.).

One of the most important policy changes to effect costing was the introduction of Payment by Results (PbR) from 2005 (Department of Health, 2010a). This marked the end of block contracts and the start of patient-level reimbursement between provider and commissioner, with mandatory tariffs for specific activity where prices are derived from the National Reference Costs. These policies triggered an interest in accurate patient-level costing systems in a growing number of trusts.

The development of within-hospital costing tools in England has been relatively slow, as issues of cost accountability in the NHS typically relate to the availability of specific treatments rather than general efficiency (Rumbold and others, 2012). It appears that any progress made was not driven by fiscal crises and a search for greater efficiency. All changes have been introduced at times when spending growth was above average, with the exception of the earliest NHS accounting reforms (Figure 1.1).

1.3 Current use of patient-level costing

The Department of Health does not mandate PLICS for NHS organisations, but it does encourage them to implement PLICS in order to fully understand and improve their business, engage with clinicians and benchmark effectively. While Monitor, the foundation trust regulator, does not require full patient-level costing, it does advocate Service Line Management (SLM). SLM is a more detailed level of financial reporting than traditional top-down methods (Moyes and Kane, 2009). PLICS and SLM are not

mutually exclusive, and many successful SLM systems are built on a PLICS base (Chartered Institute of Management Accountants, 2008). However, SLM can be implemented without full patient-level costing, and these perceived lower implementation costs are attractive to trusts looking for a ‘quick win’ (Chapman and Kern, 2010).

Most recently, the Department of Health signalled its continued support for both PLICS and SLM in *Liberating the NHS: An Information Revolution* (Department of Health, 2010b).

Extract from *Liberating the NHS: An Information Revolution*

Information and greater use of digital technologies offers the potential to deliver care more efficiently. As one example, the NHS, with encouragement from the Department of Health, is already implementing patient-level information and costing systems (PLICS). The implementation of PLICS is not mandatory but the Department of Health strongly supports the use of PLICS within the NHS. PLICS will provide organisations with the ability to understand their economic and financial drivers, benchmark their costs in detail against other providers and enable comparisons between different teams dealing with similar patients.

The implementation of PLICS will also help provide data for Service Line Management (SLM) – a combination of management and business planning techniques used by an increasing number of NHS foundation trusts. An SLM approach enables trusts to look at cost and profitability across a portfolio of services so that they can make informed decisions about how to manage existing services, prioritise new developments or plan investments. The robust reporting systems that underpin SLM give clinicians and managers the information they need to maximise resources and patient benefit.

Source: Department of Health (2010b, p. 48)

A survey by the Chartered Institute of Management Accountants (2009) found that just 17 per cent of the 53 NHS organisations that responded had implemented a PLICS system. This number was higher among the foundation trusts that responded, rising to 29 per cent. A more recent survey by the Department of Health found that 75 (48 per cent) of 155 acute NHS provider organisations that responded had implemented a PLICS system, and a further 26 per cent were in the process of implementing one (Department of Health, 2011). The highest levels of PLICS implementation (based on named respondents) was in the South East Coast Strategic Health Authority area at 100 per cent, followed by the London Strategic Health Authority area (73 per cent) and East of England Strategic Health Authority area (67 per cent).

A number of other countries have more detailed costing. The adoption of patient-level costing systems in the USA dates from the early 1980s, when Medicare systems switched to a DRG-based, fixed-price prospective reimbursement model. This gave hospitals direct incentives to manage and control costs, since Medicare reimbursements were predetermined and exposed hospitals to greater uncertainty and financial risk (Thorley Hill, 2000). A survey by Preston and others (1988) found that 24 per cent of hospitals had automated cost accounting systems capable of identifying the costs generated in treating particular patients. Thorley Hill (2000) concluded that by 1990 this had risen to 38 per cent and was driven by the revenue constraint introduced through Medicare and, to a lesser extent, competition between providers.

Bottom-up ABC is used partially in Australia and as a standard in Germany (Azoulay and others, 2007). In Australia most state health authorities have allocated funding for large teaching hospitals to implement patient-level clinical costing systems, with Western Australia, South Australia and more recently, Queensland and New South Wales sponsoring clinical costing systems purchases for their major acute hospitals (Jackson and others, 1999).

The Federal Republic of Germany decided to implement a bottom-up costing system in 2000. Although each hospital determines its exact pricing practice within the PLICS approach, exact cost allocation bases are given within strict calculation guidelines where direct costing is not possible. For certain hospitals, departments' explicit cost allocation systems are mandatory (Leister and Stausberg, 2005).

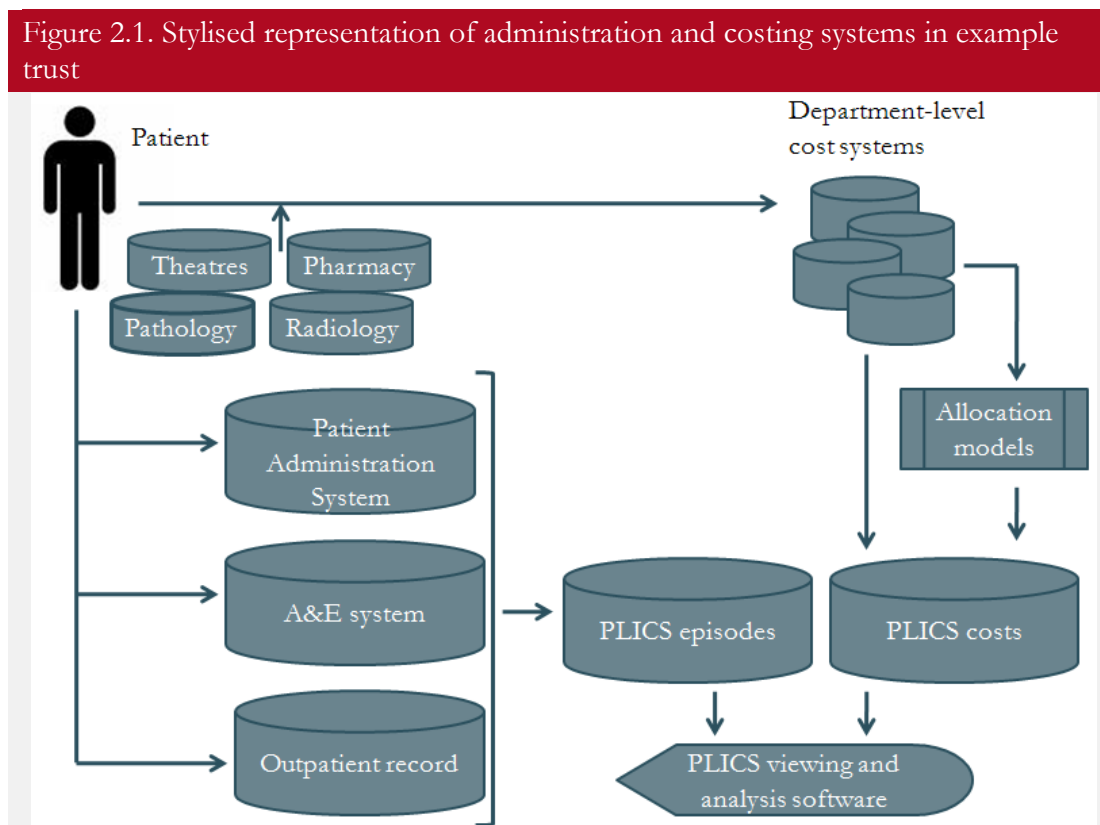
1.4 Chapter summary

- Patient-level costing is an accounting methodology that aims to track costs as accurately as possible using treatment and diagnosis data. This highly granular approach should yield more accurate and versatile information than traditional cost apportionment methods, and allow activities to be costed even when they span multiple departments.
- PLICS has its roots in ABC, which in some cases has been shown to improve efficiency in industrial organisations.
- PLICSs can be viewed as the latest point in the evolution of increasingly detailed and accurate hospital costing systems. The sophistication of costing systems in the NHS appears not to be driven by the need to be efficient, but by the forms of hospitals' income streams, as changes to the funding mechanism coincide with evolutionary steps for costing systems.
- The last 60 years has seen a slow development in the understanding of costs in the NHS. Initially it was understood as a generic cost-per-bed followed by department costs, speciality costs and HRG costs, and now as individual patient-level costs. Achieving a better understanding has been helped by the evolution of cost information, computerisation, an increasing number of cost-units and more intricate allocation processes.
- PLICS is still new in the NHS, although a recent survey showed that 74 per cent of acute NHS trusts are in process of developing PLICS or have one already. PLICS is established already in some other countries.

2 Using patient-level information and costing systems data to show cost variation

This chapter uses data from one trust to show some of the analyses that are possible from a PLICS system. An extract of anonymised patient-level cost and activity data from a major teaching hospital were used. The data covered the period between 1 April 2008 and 31 March 2009 and included details of activity from inpatient, outpatient and Accident and Emergency (A&E) departments extracted from the Patient Administration System. Additional information from a combined episode file in the PLICS system was obtained, which included data on costs and activity grouped into major cost categories or ‘cost buckets’ (Figure 2.1).

In addition to the actual costs supplied by PLICS the level of income from the Payment by Results (PbR) mandatory tariff was estimated (note that not all types of activity are covered by the mandatory national tariff).



The data were analysed for completeness and linkage between the activity and PLICS extracts. The results for the period 1 April 2008 to 31 March 2009 are shown in Table 2.1. The discrepancy between the activity and PLICS files for outpatients is due to non-attended appointments generally not being included in the PLICS database.

Table 2.1. Summary of data extracted from example trust

	Activity file (000s)	PLICS episode file (000s)	PLICS resource file records (000s)	Total expenditure (£million)
Inpatient episode records	178	178	4,958	244
Outpatient attendance records	609	429	5,900	67
A&E attendance records	84	84	1,034	13
<i>Total number of records</i>	<i>871</i>	<i>691</i>	<i>11,892</i>	<i>324</i>
Number of individual patients	207	198	–	–

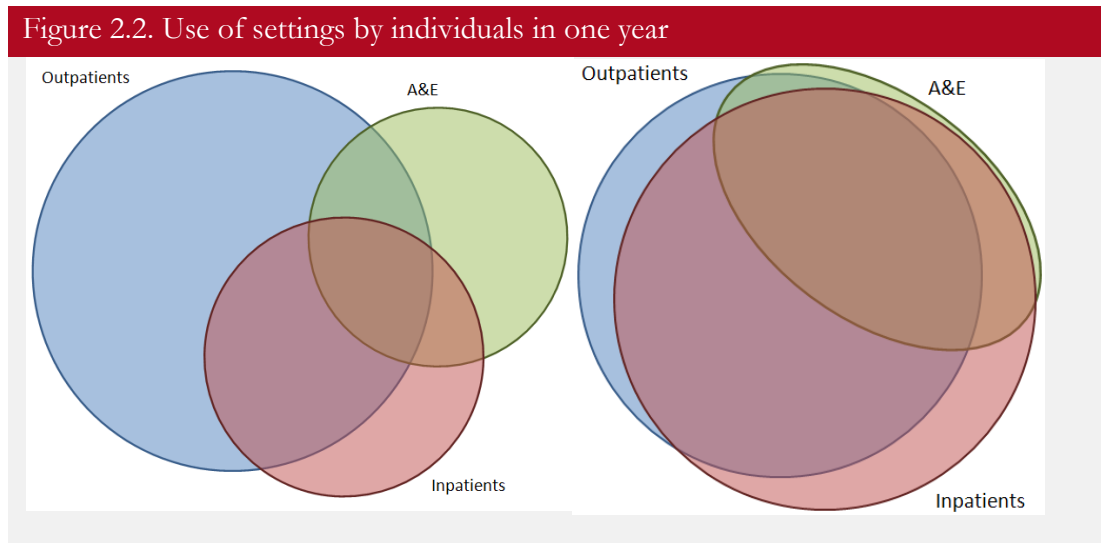
It is important to note the extra volume of information generated by the addition of patient-level costing. The episode-level activity information totals about two-thirds of one million rows (based on the PLICS file), but the costs (even at summary level) are nearly 12 million rows – a 17-fold increase.

The cost records are classified into cost buckets by the trust (sometimes called ‘cost pools’), which are general headings identifying where resources are expended within a hospital. These headings capture some information about the nature of an activity (for example related to theatres, staffing costs, drugs) and the costs associated with that activity. In some cases costs are based directly on the activity for each patient (for example, drugs consumed, tests performed). Otherwise, costs are estimated by allocating a proportion of overall costs based on a proxy measure that equate to relative use of resources (for example, days spent on a ward, minutes spent in theatre). The two largest cost buckets for the hospital were wards (accounting for 36.2 per cent of the trust’s total costs) and theatres (10.6 per cent).

While many trusts already focus on these areas using top-down costing models, a well-implemented PLICS system should offer the advantage of being able describe the case-by-case variation within a cost area to highlight potential inefficiency.

2.1 Overlap of use by care setting

In 2008/09 more than two-thirds of one million episodes of care were shared across just under 200,000 individual patients across its inpatient, outpatient and A&E departments. The PLICS data allows us to understand the overlaps in activity and cost between multiple services as shown in Figure 2.2, where the left side represents the overlap in the number of patients, and the right side represents the overlap in costs.



Note: Area of bubble reflects number of individuals using a service (left) and the costs (right).

The majority of activity was concentrated in the outpatients department, with 77 per cent of all individuals being seen in this setting and 43 per cent of all individuals only using outpatient services. The same measures for inpatient and A&E services were 37 per cent and six per cent, and 19 per cent and 13 per cent respectively. Of all individuals 62 per cent used only one of the services, 19 per cent used both inpatient and outpatient services, and only nine per cent used all three.

The way that these individuals consume resources is very different: activity is biased towards outpatients and A&E, whereas the costs are biased more towards inpatient care, the largest costs being people who used inpatient and outpatient services (41 per cent of all costs) and patients using all three settings (30 per cent). In short, 27 per cent of patients consume 71 per cent of resources.

2.2 How do costs vary within a Healthcare Resource Group?

Case-mix classifications have been used for some time as a basic unit for funding hospital activity (Kimberly and others, 2008): in addition, they can act as a common link between the worlds of the clinician (in that they describe different patient and treatments methods, albeit crudely) and finance. This is important, as decisions about efficiency must involve some understanding of the care provided and so engage clinicians.

Information management and technology manager in an NHS trust

They [clinical and general managers] can see whether other services or another clinician or different specialty or HRG is profitable and what are the drivers for them being profitable. While a lot of these things might seem as though they are cost focused, the drivers are actually around performance issues.

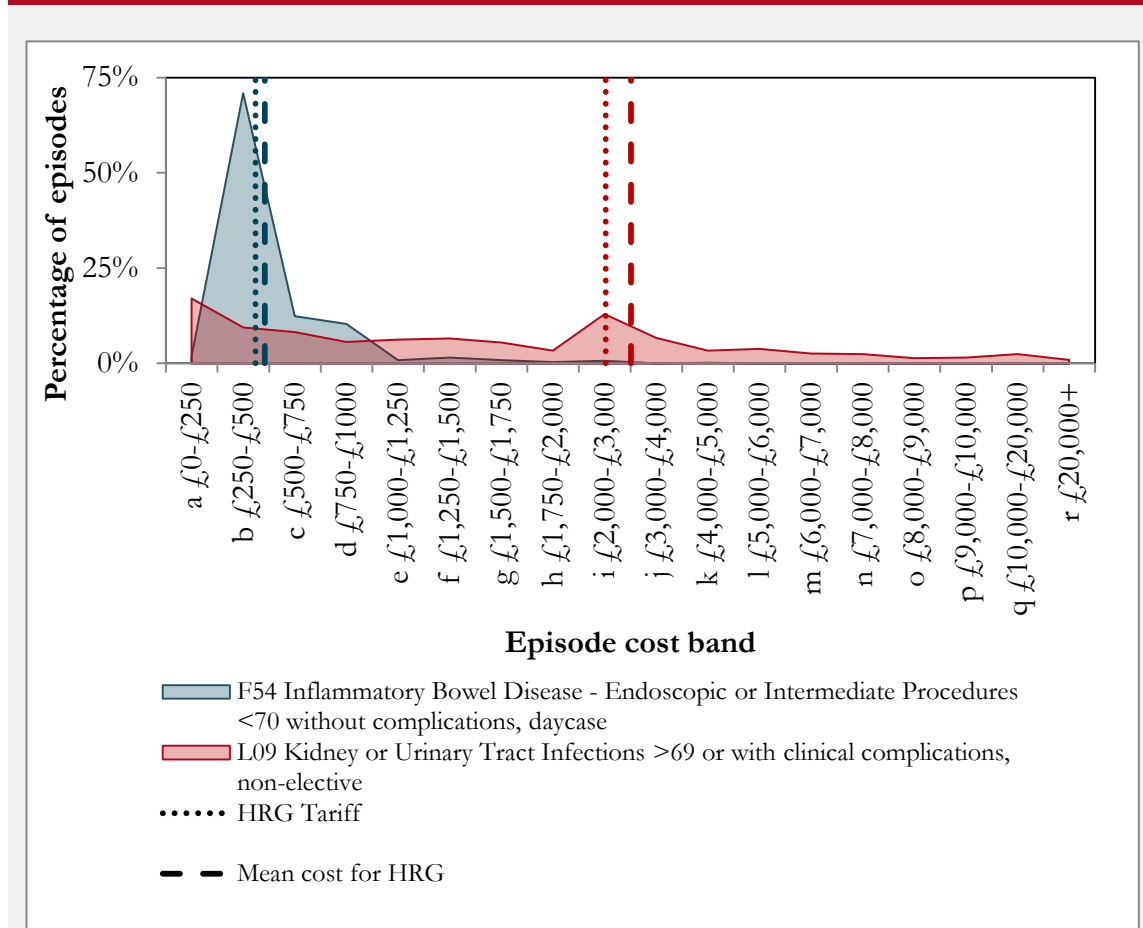
Source: Carlisle (2010)

Although a case-mix classification such as HRG strives to group patients with similar costs, it seems that substantial cost variation can exist within HRGs and the degree to

which this happens is itself variable. Figure 2.3 shows the distribution of costs for HRGs in terms of the percentage of episodes falling in broad cost bands. A hospital without PLICS systems would know only the HRG tariff cost (solid vertical lines in Figure 2.3) or some estimated average cost (broken line), yet with a PLICS system it is possible to see the distribution of costs.

Both HRGs in Figure 2.3 have around 600 episodes. The episode costs of the F54 HRG are very tightly distributed, with more than 70 per cent of episodes costing between £250 and £500. Episode costs of L09 are much more variable. Some of this variation may be due to the difference between case mix seen in the non-elective and daycase settings and some may be due to the nature of the diagnoses and treatments that fall under these HRGs.

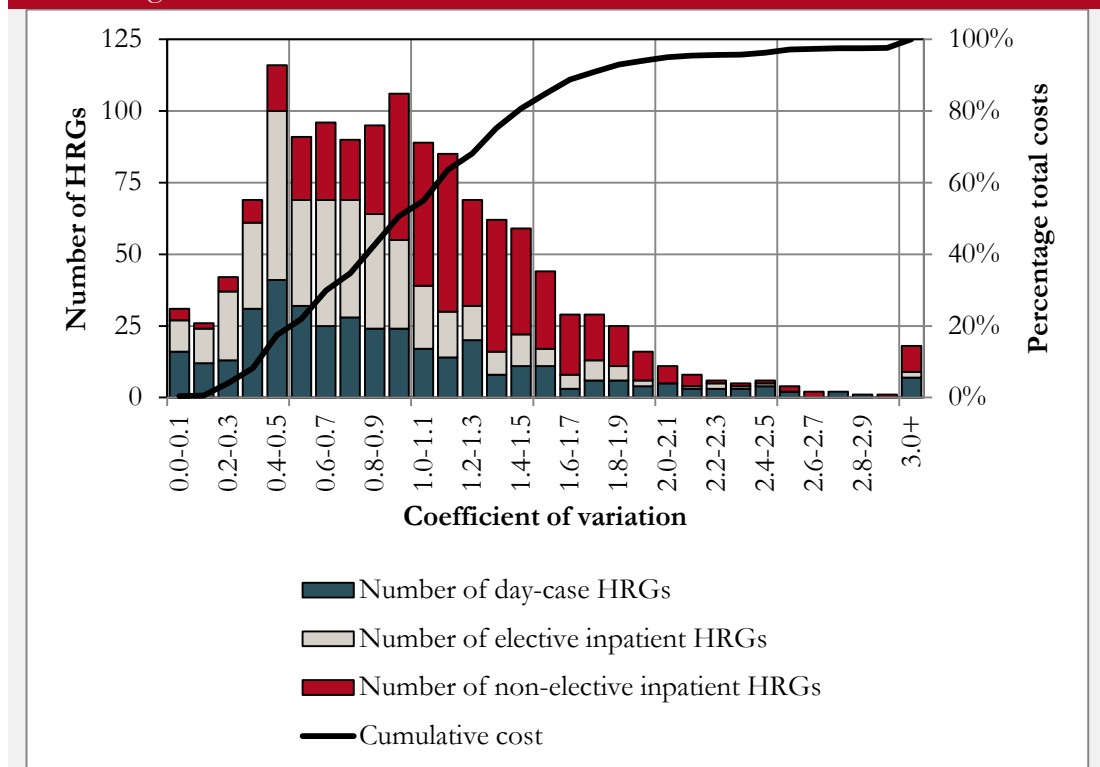
Figure 2.3. Example episode cost distributions by Healthcare Resource Group and care setting



Note: Mean HRG costs shown as broken vertical lines and the trust's 2008/09 tariff price (assuming single episode spells with no excess bed days or specialist top-ups) is shown as solid vertical lines.

The variability in patient-level costs within an HRG can be summarised by looking at its coefficient of variation (that is, the standard deviation divided by the average cost): the lower this ratio becomes, the less variation between episodes within an HRG. Figure 2.4 shows the distribution of coefficient of variation by HRG for day-case, elective and non-elective inpatients, as well as the cumulative percentage of total costs in those settings.

Figure 2.4. Distribution of Healthcare Resource Group-level coefficient of variation by care setting



Note: Overlaid with the proportion of total costs generated by Healthcare Resource Groups.

Most HRGs have a coefficient of variation between 0.4 and 1.4. Non-elective HRGs tend to be more variable. The scale of costs in the more variable HRGs suggests that potentially substantial savings are available if the causes of variation can be understood and addressed. Reducing high cost variation in this region by around one-tenth on average could yield savings of nearly £11 million (six per cent).

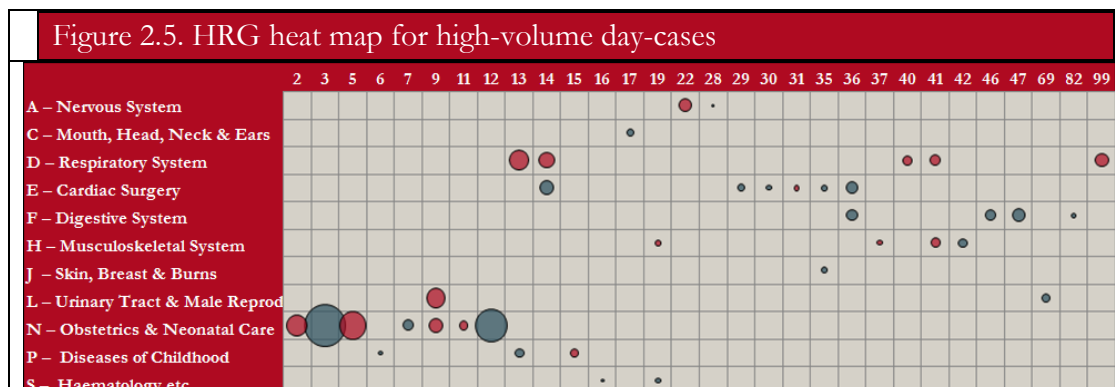
However, not all causes of variation will be under the trust's control. These may include problems in the HRG's definitions as well as external factors such as the social and economic circumstances of patients. For example, Sanderson (2010) noted the tendency for longer lengths of stay to be associated with areas with high levels of deprivation, even when supply factors were taken into account.

2.3 Understanding what lies behind high average costs

The example trust in this study reports its PLICS results through specialist business software that allows users to explore the data interactively. The system includes a series of standard management information reports, as well as the capability to let users create their own reports and drill down to the underlying detail of individual cost.

Being able to summarise cost variation across a hospital's activity is an important tool and can be used to identify areas of inefficiency. For example, Monitor has proposed a visual approach for service line reporting (Monitor, 2006). The examples below show ways that PLICS data can be presented to help focus attention on areas of relatively high or low cost.

First, an example of summarising by HRG is shown in Figure 2.5. This is based on non-elective inpatient activity and shows all the HRGs treated in the hospital. Each cell represents a different HRG and cells with more than 250 episodes in have been coloured.



Note: the difference between total cost and PbR tariff payments (including adjustments for patients staying in hospital longer than expected) is shown by size of the bubble, where colour indicates surplus (teal) or deficit (red). Each cell represents a different HRG (with >250 cases) with the chapter across the columns and HRG number in its rows.

In addition to these types of maps, PLICs allows users to look at the variation between patients in much more detail. Table 2.2 shows the five highest surplus and highest deficit day-case HRGs (of HRGs with more than 250 cases). It is interesting to note the comparatively low level of variability (as measured by the coefficient of variation) of high-surplus cases compared with high-deficit HRGs. The HRGs where income exceeds costs tend to be more predictable.

Table 2.2. Top and bottom five day-case HRGs with more than 250 cases, by total surplus

HRG	Description	No. of spells	Total surplus	Coefficient of variation
L48	Renal replacement therapy without clinical complications	6,706	£ 3,769,367	0.22
C58	Intermediate mouth or throat procedures	2,966	£ 1,430,250	0.92
J37	Minor skin procedures: Category 1 without clinical complications	2,672	£ 1,067,577	0.92
F35	Large intestine: endoscopic or intermediate procedures	3,082	£ 588,092	0.93
A07	Intermediate pain procedures	1,270	£ 539,467	1.03
F56	Inflammatory bowel disease <70 without clinical complications	332	-£ 52,429	6.44
M10	Surgical termination of pregnancy	303	-£ 62,951	1.99
M05	Upper genital tract minor procedures	350	-£ 68,905	2.66
C22	Intermediate nose procedures	270	-£ 73,658	5.67
K10	Inborn errors of metabolism	484	-£ 203,210	8.86

Note: The table also shows the number of spells and the coefficient of variation of case surpluses within HRG.

As mentioned previously, identifying HRGs with unusual or undesirable cost patterns is only the first step. The power of the PLICS data really becomes apparent when it is used to explain the cost variation between cases. Table 2.2 identified the high-volume

day-case HRGs with the greatest deficit against tariff. The following examples explore these in more detail.

Example C22 (Intermediate nose procedures)

Costs: Day-case treatments for intermediate nose procedures cost a total of £434,648. The average cost of a C22 spell was £1,610 and the average payment was £1,337, causing an average deficit against PbR in each case was 14 per cent. There were 270 cases in 2008/09, with the youngest patient being two years and the oldest 87 years. The distribution of costs and cases is shown in Figure 2.6.

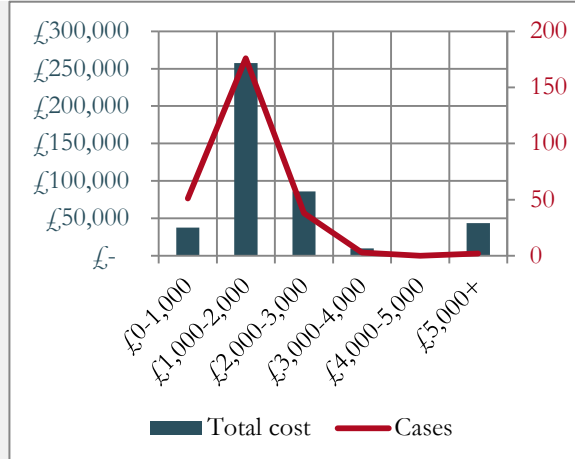


Figure 2.6. Total costs and number of spells categorised by spell cost band for C22 day-cases

Explanations: Only 38 per cent of cases cost less than the tariff reimbursement. Ten per cent of the total C22 costs are contributed by just two cases, both costing more than £20,000. These cases account for just under half of the total HRG deficit. Further analysis reveals that both had long lengths of stay (13 and 14 days), meaning that although they were admitted as elective day-cases, they required a much longer spell in hospital (most likely as a result of a clinical complication, as both have secondary diagnoses related to the immune system).

The most common five diagnoses account for 82 per cent of cases. These divide into two types: nasal polyps (J33 – 25 per cent of cases) and other disorders of nose and nasal sinuses (J44 – 61 per cent); these contribute 55 per cent and 33 per cent of the deficit caused by loss-making diagnoses, respectively. Exploring the J33 cases in more detail, around one-third of cases were surplus-making but no obvious relationship was found between deficit and procedure, number of procedures, secondary diagnosis or age.

Exploring the composition of the costs reveals that the degree of deficit is directly proportional to theatre costs ($R^2 = 0.54$). The average theatre cost was £828, with a standard deviation of £515 and on average contributes 54 per cent of the episode cost. J33 and J34 cases use the same proportion of total costs on theatre costs, but theatre costs are greater in J33 cases.

Conclusions: This analysis has revealed that the deficit in this HRG is caused by variation in theatre costs. Unlike the first example, which pointed to a characteristic of the patient's condition, it has highlighted an element of the pathway. This can form a useful starting point for engagement with clinicians in a root cause analysis.

Example F56 (Inflammatory bowel disease <70 w/o cc)

Costs: Daycase treatments for inflammatory bowel disease <70 w/o cc cost a total of £188,366. The average cost of a F56 spell was £567 and the average payment was £409, causing an average deficit against PbR in each case of 38 per cent. There were 332 cases in 2008/09, with the youngest patient being 12 years and the oldest 66 years. Only 21 per cent of cases were in deficit against the tariff. The distribution of costs and cases is shown in Figure 2.7.

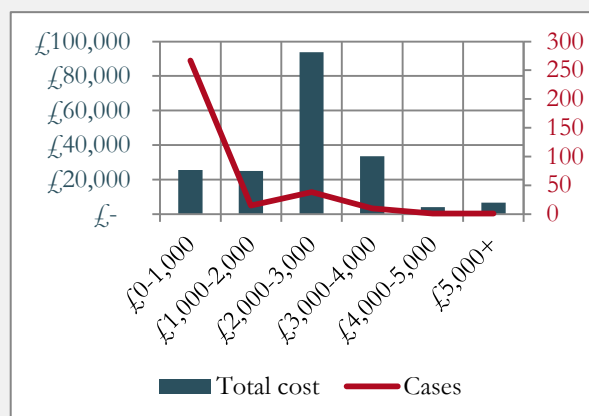


Figure 2.7. Total costs and number of spells categorised by spell cost band for F56 day-cases

Explanations: This is a relatively homogenous HRG, with two diagnoses covering 86 per cent of cases. However, both result in deficit: an average of 21 per cent per case for Crohn's disease of the large intestine (K501, 201 cases) and 46 per cent for other Crohn's disease (K508, 77 cases). Of all cases, 95 per cent receive the same primary procedure: continuous intravenous infusion of therapeutic substance not elsewhere classified .

Sixty-seven cases have drug costs associated. The average surplus for cases without drug costs is £304, whereas the average deficit for those with drug costs is £1,986. There are no set of co-morbidities that appear predictive of incurring drug costs and their use is not related to age: 91 per cent of cases without drug cost are treated in gastroenterology specialty, whereas this falls to 78 per cent of cases with drugs cost. The remaining cases are treated under paediatrics. The two most active consultants (accounting for 80 per cent of all cases) have a very similar propensity to incur drug costs (18 per cent of cases versus 21 per cent).

Conclusions: The deficits in this day-case HRG are driven by the use of high cost of drugs in a minority of cases. The need for these drugs is not reflected in coded diagnoses or procedures, so variations can be understood only through further discussions with clinicians.

Deputy director of finance in an NHS trust

The information has helped enormously to inform our discussions across a range of issues as we know which areas are profitable or not and, most importantly, we can start to explain why. It also helps to set our prices when tendering for new work, ensuring that we remain competitive.

With clinicians also able to interrogate information that hasn't always been easily accessible, they are now better able to work with managers to identify problem areas and work together to rectify them. Already, regular Service Line Reporting and Patient Level Costing information has had a significant impact on [the trust's] Cost Improvement Programme, helping it to set differential targets based upon Service Line Reporting Information and is helping managers understand where cost improvements can be achieved.

Source: Bellis-Jones Hill (2008)

2.4 Variations between consultant teams

Figure 2.8 shows a 'heat map', this time focusing on consultant team (columns) and HRG (rows) and coloured by mean episode cost.

Figure 2.8. Heat map showing mean episode costs by consultant team for HRGs

HRG	Description	Consultant team										
		1	2	3	4	5	6	7	8	9	10	11
L02	Kidney Major Open Procedure >49 or w cc	Red	Yellow			Yellow		Green				Green
L03	Kidney Major Open Procedure <50 w/o cc		Red					Yellow				Green
L04	Kidney Major Endoscopic Procedure	Red								Green		
L12	Ureter Major Endoscopic Procedure	Yellow					Red	Orange		Yellow		Green
L13	Ureter Intermediate Endoscopic Procedure	Yellow				Red		Green		Red		
L17	Bladder Major Endoscopic Procedure	Yellow	Red	Yellow	Yellow	Green	Yellow	Yellow	Yellow	Yellow		Green
L18	Bladder Intermediate Endoscopic Procedure w cc		Yellow	Green	Yellow		Yellow		Yellow		Yellow	Red
L19	Bladder Intermediate Endoscopic Procedure w/o cc			Green	Yellow	Yellow			Green	Red		
L20	Bladder Minor Endoscopic Procedure w cc				Red	Green						
L21	Bladder Minor Endoscopic Procedure w/o cc				Red	Green	Green					
L27	Prostate Transurethral Resection Procedure >69 or w cc	Yellow	Yellow	Yellow			Yellow	Green	Yellow	Yellow	Red	Yellow
L28	Prostate Transurethral Resection Procedure <70 w/o cc										Red	Green
L34	Urethra Intermediate or Minor Procedures >69 or w cc		Red	Green		Yellow	Yellow		Orange			Yellow
L35	Urethra Intermediate or Minor Procedures <70 w/o cc		Yellow							Red		Green
L43	Scrotum Testis or Vas Deferens Open Procedures <70 w/o cc	Green						Red	Red			
L68	Cystectomy with Urinary Diversion and Reconstruction				Red	Green						
S22	Planned Procedures Not Carried Out	Yellow	Red		Yellow			Green		Green	Green	Green

Note: Heat map showing mean episode costs by consultant team for HRGs where the consultant team performed five or more cases as elective inpatients in 2008/09 for the urology specialty in two or more HRGs, and HRGs had two or more consultant teams active. Cells are coloured green (lowest mean episode cost) to red (highest) within HRG.

The heat map shows the summary costs between consultants. Comparing consultants 2 and 7, for example, reveals that number 7's average costs are consistently lower than number 2's across all comparable HRGs. At face value it appears that consultant 7 is highly efficient while consultant 2 is not. However, looking at the patient-level data shows that consultant 2 performed nearly twice as many episodes as consultant 7, consultant 2 routinely treats older patients than consultant 7, and consultant 2's average ward costs are much higher in each HRG.

2.5 Comparing costs with tariff: expenditure and income

Most hospital trusts can estimate income from tariff fairly easily and segment this according to care setting to give overall profit and loss. However, the ability to say whether the hospital is making a surplus or deficit (profit or loss) on each case critically depends on the level of detail in its costing systems. For a PLICS-based system it is easy to identify the care settings that made a surplus or deficit overall, as in Table 2.3, which shows the total mandatory tariff income, total cost and number of PbR spells, proportion of all spells for which PbR applies, the correlation between tariff payment and case cost and the proportion of cases causing notable surplus or deficit.

Table 2.3. Surplus and deficit by care setting for activity funded by tariff payments, also showing correlation between tariff payment and actual (final) cost for each care setting

Care setting	(1)	(2)	(3)	(4)	(5)	(6)		
	Income (millions)	Final cost (millions)	PbR spells (000s)	% total activity in setting	Correlation between case payment and cost (* = significant)	% cases		
						Surplus	Break-even	Deficit
Day-case	£45.3	£28.4	53	53%	0.35*	80%	7%	14%
Elective	£44.7	£55.0	15	90%	0.71*	37%	15%	49%
<i>All elective</i>	£90.0	£83.4	68	58%	0.72*	70%	8%	21%
Short-stay non-elective	£18.6	£9.9	20	97%	0.43*	83%	6%	11%
Longer stay non-elective	£88.2	£120.1	27	95%	0.66*	46%	11%	43%
<i>All non-elective</i>	£106.9	£130.0	47	96%	0.68*	62%	9%	29%
Outpatient	£39.1	£48.9	303	71%	0.25*	37%	22%	41%
A&E	£8.1	£13.2	84	100%	0.22*	26%	10%	64%
TOTAL	£244	£275.6	502	74%	–	42%	17%	41%

Note: Surplus and deficit are defined as costs falling under or exceeding payment by 10% or more. Short-stay non-elective admissions are those lasting fewer than 48 hours. Correlations were performed using Pearson's test and significance is noted above the 99% confidence level.

Traditional costing mechanisms are only capable of producing the first four columns of Table 2.3, and even then the split between inpatient modes will be approximate.

Of the 166,294 inpatient spells, 70 per cent were eligible to be reimbursed through PbR. The most common reason for spells to be ineligible were patients classed as a regular attendee (25 per cent of all spells), and patients treated in specialty or HRG not covered by the mandatory tariff (seven per cent), although these groups are not mutually exclusive. Using the outpatient attendances listed in the PLICS extract, 31 per cent of outpatient events were not coded because they occurred in a speciality not covered by PbR. All A&E attendances were PbR applicable. More recently, the introduction of HRG4 in the 2009/10 tariff has increased the number of HRGs eligible for the mandatory tariff.

While the trust was in surplus overall (based on its audited annual accounts), it appears that its tariff work operated at a 13 per cent deficit. Also, this analysis shows that surpluses are not uniform across care settings, neither are they consistent between modes of treatment within inpatient care.

This analysis highlights some interesting findings.

- 1) Long-stay elective care made a deficit, but there was a large surplus made on day-cases: the single elective tariff in 2008/09 was designed to encourage providers to use the cheaper day-case approach where possible and deliberately underfund longer-stay elective care. The 2009/10 tariff re-implemented differential pricing between day-case and other elective spells for some HRGs.

- 2) The same appears to be true for non-elective inpatients, in that when broken down into short stay (fewer than 48 hours) and longer stay, we see that the short stays create a substantial surplus. There has been recent concern about the rate at which short-stay emergency admissions have been increasing in England (Blunt and others, 2010).
- 3) The care settings which had the strongest correlation with tariff were those that involved extended stays in hospital – an indication that payment and costs are better matched in longer-stay cases, likely as a facet of time spent on ward.
- 4) In more than half (62 per cent) of non-elective cases the tariff reimbursement exceeded the cost of care. This suggests that the distribution of costs with non-elective cases was skewed towards a minority of very high-cost cases. One approach to reimbursing these extreme cases might be to use a ‘stop-loss’ measure: that is, where losses beyond a certain amount per case are funded by another body (possibly the commissioner or central government) or pooled between a number of organisations (either the provider and commissioner, a group of provider organisations or an insuring body). Putting in a stop-loss measure of £10,000 per spell would affect 2.3 per cent of spells and restrict the deficit against tariff to £7.4 million.
- 5) Only 17 per cent of all cases had costs which fell between 90 per cent and 110 per cent of their tariff payment. This suggests that variation in costs causes the tariff to be a poor match for the cost of most individual cases. However, the result that the number of cases in surplus was roughly equal to the number of cases making a deficit (overall and in the outpatient and longer-stay inpatient settings) could provide evidence that the tariff matches costs better over large sets of activity.

These figures were produced by applying the mandatory PbR tariff to the eligible activity. However, the example trust in this study often repackages expensive HRGs out of the mandatory tariff on the basis that this does not cover its costs. PLICS data are essential to be able to justify this to commissioning primary care trusts, and the example trust routinely shares PLICS reference costs with commissioners to facilitate negotiations. While this will cause their commissioners to pay above tariff in some cases, the example trust believes that there is a benefit to commissioners from using these techniques to set total contract value, in that they are paying below tariff for HRGs where the example trust is in surplus against the tariff.

2.6 Improving tariff costs

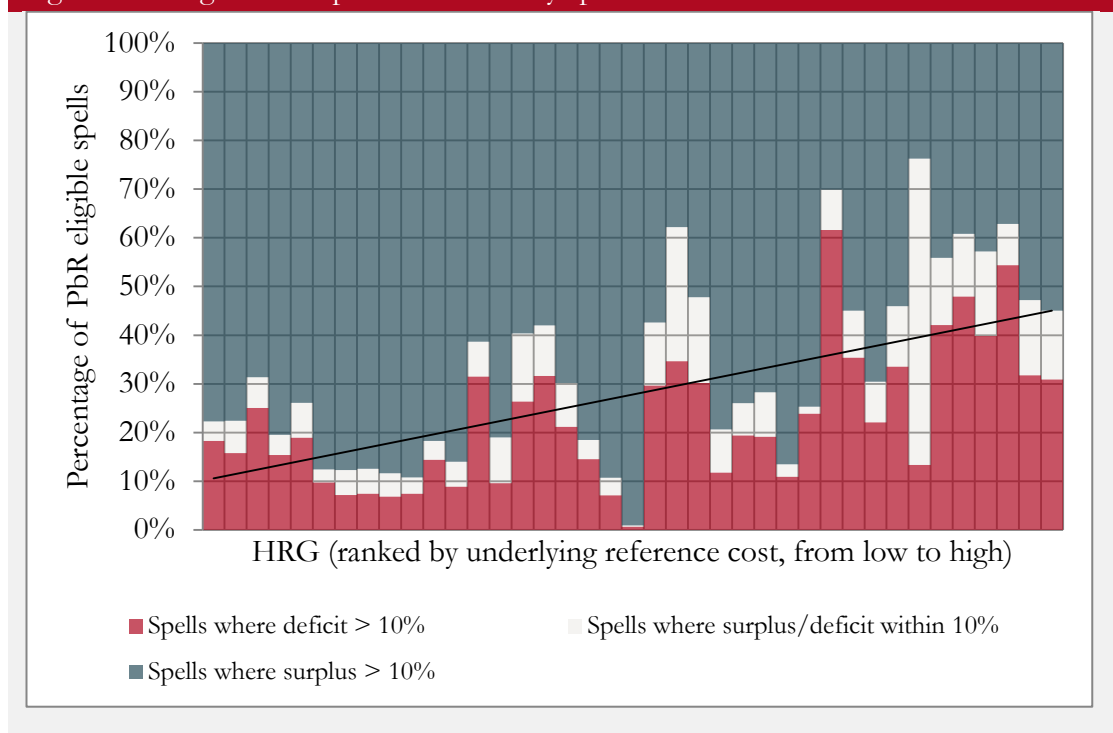
The example trust in this study sees one of the main purposes of its PLICS system as being the ability to lobby on and inform future tariff development. It also highlighted volatility in the tariff as a disincentive to base efficiency programmes on surplus or deficit (as opposed to absolute costs). This appears to be a common concern, and the chief executive of another NHS hospital trust commented that it can be demotivating that although costs have stayed the same from one year to the next, a service may have moved from surplus to deficit because of a change in the tariff price. For example, a procedure with consistent costs may appear ‘efficient’ one year, yet will appear

‘inefficient’ if the tariff changes by a significant amount (Personal communication with the chief executive of a large NHS hospital trust, 2010).

The level of tariff is one of the most powerful system-wide levers to incentivise efficiency, but careful consideration needs to be given to the balance between driving efficiency and controlling costs (Nuffield Trust, 2010). An important observation from the authors’ PLICS analysis in the present study is the poor performance of the mandatory national PbR tariff in reimbursing individual cases cost. It only reimburses ‘accurately’ (within a margin of 20 per cent) for one in six of cases in the example trust. In addition, it appears systematically biased towards overfunding low-cost cases and underfunding more expensive ones; this has the potential to encourage providers to focus on profitable simple procedures at the expense of more complex, loss-making activity.

Where appropriate, PbR increases the tariff price for long stays and specialist treatment. These measures should mean that surplus and deficit (defined by costs outside ± 10 per cent of payment) are equally likely, whatever the expected cost of the activity. Figure 2.9 shows the distribution of surplus or deficit by HRG in order of increasing expected costs. There is a clear relationship between level of reimbursement and the chances of an inpatient spell being either in surplus or deficit. In terms of PbR payments, only 18 per cent of spells that paid £500–£750 caused a deficit greater than 10 per cent, a result that rises to 67 per cent for spells reimbursed at more than £20,000.

Figure 2.9. Degree of surplus and deficit by spell cost



Note: Regression line is on midpoint of surplus or deficit for PbR applicable inpatient spells (based on high-volume HRGs).

Clearly, in some instances the tariff is not intended to match an average cost: for example, when it is set to drive policy objectives such as moving inpatient treatment to day-case. The problem is where inaccuracies happen for other reasons and remain

largely unknown, then efficiency is at the mercy of the mix of cases treated. This is particularly problematic when some hospitals treat a greater share of case types, where the tariff underestimates the actual costs of treatment. While continual refinement of PbR is an economic necessity, the rationale for adjustment needs to be explicit and consistent (Street and Maynard, 2007).

An alternative to an itemised tariff that could be considered is a move to person-based (capitated) annual tariffs based on patient characteristics, where the provider receives a set fee for providing all secondary care required during the year. This would encourage integrated care packages, avoid some of the more toxic elements of a fee-for-service scheme and potentially improve accuracy due to the reduced complexity of pricing. This is similar to the approach being developed for mental health PbR (Department of Health, n.d., b).

2.7 Chapter summary

PLICS reveals a substantially more detailed picture of costs than would have been available using top-down allocation costs. For example, previous methods gave general cost per visit in broad settings (inpatient, outpatient, A&E) or all treatment by a department. PLICS data allows us to produce accurate breakdown (including long and short stay) and describe the case cost distributions within settings. The total costs for day-case, elective and non-elective inpatient settings are skewed by a minority of high-cost cases. Analysis of patient level cost data combined with patient-level activity data has enabled the following to be demonstrated.

- An improved view of surplus and deficit (by comparison with the PbR tariff).
- An ability to measure surplus and deficit in each individual case. Case level profit and loss varies by care setting and length of stay.
- In the example trust there is a poor match between the tariff and costs at case level. Only 17 per cent of tariff-chargeable cases had costs which fell between 90 per cent and 110 per cent of their tariff payment.
- The number of tariff-chargeable cases in surplus is roughly equal to the number of cases making a deficit (overall and in settings, except urgent care), suggesting that the tariff matches costs over large sets of activity rather than individual cases.
- There is a direct relationship between the level of reimbursement and increasing chance of a spell generating a deficit against tariff for the trust.
- An ability to target specific areas based on cost pattern.
- This work has presented three different methods of scanning costs across a setting by summarising spending patterns visually. These swiftly reveal areas with unusual or undesirable spending patterns, allowing more detailed follow-up analysis using the PLICS dataset.

- There is considerable variation between HRG and consultant team spending patterns, even within a care setting or specialty.
- Power to explain and understand variations in cost patterns.
- Cost variation within HRGs can be understood, in some cases, by examining the patient-level cost data. The study analysis was able to explain cost variations as high-cost outliers with a specific diagnosis or variation in the use of theatre time and drugs.
- The PLICS data allowed an exploration of cost variation between urology consultants and to propose a possible cost trade-off between ward time and other resource use that could be allowing one consultant to have generally lower overall costs than another.
- Looking across a number of cases reveals important patterns of variation. Three-quarters of total costs are in the coefficient of variation range of 0.5–2, which suggests that potentially substantial savings are available if the causes of variation can be understood and reduced. Reducing the variability by just one-tenth in these cases could produce savings of £11 million.
- Higher case fatality rates by HRG do not appear to be linked to higher episode cost variation.

Set against these benefits, PLICS produces (and requires) substantially more data compared to the standard administrative activity dataset (around a 17-fold increase).

3 Patient-level information and costing systems: the benefits in practice

In 2009 the Department of Health identified five key advantages that a properly implemented PLICS system could realise (see Box 3.1). This chapter considers what evidence there is on these points, as well as looking at some of the barriers to the development of PLICS.

Box 3.1. Benefits of PLICS as described by the Department of Health

The Department of Health cites the main benefits of a properly implemented PLICS system as:

- a) transparency to an organisation of their income and costs at a service and sub service level on a monthly basis
- b) dramatically improved clinical ownership of operating information (comparisons can be made against peer groups, teams, individuals as well as care pathways)
- c) crucial information to inform any future change in the grouping and classification of patients
- d) necessary and crucial information to inform funding policy for payment of high and low outliers for each HRG
- e) valuable data in discussions with commissioners.

Source: Department of Health (2009)

3.1 Transparency of income and costs

The analysis of patient-level cost and activity data from one NHS foundation trust in this study for the period 1 April 2008 to 31 March 2009 found substantial cost variations within case-mix categories that can be revealed only by inspecting the PLICS data. Combining patient-level activity and cost data allows forensic analysis of cost variations, either explaining them or providing solid evidence on which to base discussion with clinicians (in a language of diagnosis and treatment rather than cost centres and allocation models).

Clearly, the main advantage is the insight provided by costing at a very detailed level and the flexibility it allows when reporting costs (for example, patient level, consultant level, service level, department level and trust level are all sustained by a single information system).

Finance director in an NHS trust

It's an extremely powerful management information and reporting tool and while the results have confirmed some of our existing views, it has also given us some interesting insights. The system has given us the ability to explain those insights and has provided us with the information that has enabled us to benefit from them.

Source: Bellis-Jones Hill (2008)

3.2 Improved clinical ownership of operating information

The intelligence obtained from patient-level costing is just the first step towards unlocking efficiency. First, any cost variations highlighted must be understood and then assessed as to whether the variation is clinically valid or controllable. This can be done only through thorough engagement with clinicians who are making the critical decisions about

the inputs that individual patients receive: the importance of clinical involvement and ownership in this process cannot be overstated.

One of the main methods of engaging clinicians in costing issues always has been seen as translating cost data in a language that they use: the ‘currency of the clinician’. This ambition is not new; it drove experiments in specialty costing and clinical budgeting originating in the 1980s and 1990s. The greater granularity of PLICS allows costs to be linked more meaningfully to clinical data, triggering clinical engagement from consultants who now can see costs linked to their individual actions (Chapman and Kern, 2010).

However, specific examples of improved clinical engagement as a result of introducing PLICS are surprisingly rare. This might be because most PLICS systems are still in their infancy, or individual examples of improved clinical engagement are hard to quantify or seem too trivial to publish. The examples that do exist typically relate to clinicians engaging with and improving cost apportionment models, rather than acting directly on the cost information. Anecdotally there are examples of patient-level costing data acting as a trigger to improve theatre utilisation, when the costs of unused theatre time are attached to individual consultants.

The Audit Commission report also noted that ‘trusts feel that patient level costing is more helpful locally’ (2010, p. 7) and there is little clinical engagement in reference costs, with trusts seeing the new service level reporting, Service Line Management (SLM) and PLICS as the way to achieve clinical engagement. The same report noted that many organisations which have implemented PLICS comment that generally the process has improved their data quality.

Given the importance attached to this potential benefit of PLICS, it would make sense for policy-makers encouraging the introduction of PLICS to prioritise the collection and publication of specific, demonstrable examples of improved clinical engagement.

Head of financial developments and costing in an NHS trust

Having accurate and reliable feeder systems allows the clinicians and managers to drill down from a high level specialty level service line report through to the actual resources used and income received by a particular patient or groups of patients at [the trust].

Source: Chartered Institute of Management Accountants (2009, p. 11)

3.3 Inform the grouping and classification of patients

Chapter 2 of this report explored presentational formats that can summarise and detect swiftly undesirable cost/surplus patterns. It also demonstrated examples of chasing down the root cause of cost variations using PLICS data.

This report also has proposed techniques to exploit PLICS data beyond episode-level studies. Although presented in outline, these suggest important findings and developments (such as that 45 per cent of costs are expended on three per cent of users, and a method to provide a simple day-by-day visual cost breakdown) and are likely to prove a fruitful avenue for further research.

When the example trust in this study negotiates local prices with the regional specialist commissioning group, it typically negotiates for a package of care and rehabilitation, not just the single hospital spell as in PbR. PLICS is used to inform the package price.

3.4 Inform funding policy for payment

Perhaps the key finding from the PLICS analysis in the present study is the poor performance of the mandatory national PbR tariff in reimbursing individual cases cost. It only reimburses within a margin of 20 per cent of actual costs for one in six cases, and it appears systematically biased towards underfunding more expensive cases. This demonstrates the power of PLICS information to inform funding policy for payment. The greater number of trusts that have access to this level of information will mean the greater influence that they could have.

Indeed, the example trust in this study sees an important purpose of its PLICS system as being the ability to lobby on and inform future tariff development. They also highlighted volatility in the tariff as a disincentive to base efficiency programmes on surplus/deficit (as opposed to absolute costs) and the demotivating effects on staff of realising that their costs have stayed the same one year to the next but they have moved from surplus to deficit because of a change in tariff price.

Deputy director of finance in an NHS trust

The cost of radiology scans was previously heavily influenced by Korner weightings that were used in the previous approach to Reference Costing [and] the resulting costs of radiology scans seemed to be counter-intuitive – certain scans seemed to [be] very expensive, while complex scans for in-patients seemed relatively inexpensive. This could have posed a problem to the trust if the charging for radiology scans was based on such data. However, closer examination by clinicians and managers together quickly highlighted the fact that Korner weightings are now insufficient to reflect what is really driving the cost of patient scans and a more sophisticated approach was required. The result is that the simple scans are now charged at a much lower price to reflect the lower work content while the more complex scans, often for in-patients, are charged at a higher price so that the real financial cost of providing treatment is reflected more accurately.

Being in more control of our cost information has enabled the trust to become more commercially aware and has contributed to the improved quality of our business cases.

Source: Bellis-Jones Hill (2008)

3.5 Data for discussions with commissioners

The example trust in this study negotiates with its commissioners to repackage a number of HRGs out of the mandatory tariff on the basis that this does not cover its costs, particularly for HRGs costing more than £10,000. This approach began in 2008/09 and has increased in later years. PLICS data are essential to be able to justify this to the commissioning PCTs, and the example trust routinely shares PLICS reference costs with commissioners to facilitate negotiations. The benefit to commissioners is that in setting a total contract value they are not paying above cost for HRGs where our example trust is in surplus against the tariff.

There are several anecdotal examples of the value of openness in negotiations, where the cost data are shared between provider and commissioner in order to avoid time-consuming debates and suspicion around the prices for which the provider is asking.

While these open data arrangements appear to be positive developments, there are two potential concerns for the future. First, the change from primary care trusts to general practice (GP) consortia as commissioners leaves providers potentially facing many more commissioners with which to negotiate and establish relationships, which will mean an associated drain on their staff time. Second, the advent of PLICS means that providers have a very advanced understanding of their costs, something to which the commissioners are not guaranteed access. This creates information asymmetry, which can have a detrimental effect on the efficiency of a market. To guard against this, policy-makers could mandate some level of cost information-sharing between providers and commissioners.

One NHS trust's experience of exploring costs using patient-level costing

[The trust] was already carrying out a detailed review of financial management when a manager pointed out a single item in Orthopaedics. A £10,000 invoice for a single knee prosthesis was the first indication to the finance department that such costly devices were being used in the trust: previously, these costs were buried within invoices for multiple devices, disguising exceptionally expensive elements. The immediate concern was that the National Tariff would not even cover anything like the cost of the prosthesis alone.

In this case, it emerged that the prostheses were only very rarely used, on patients who were on a first or second revision of the operation, and who were young enough to need a prosthesis that would last for decades. In other words, there were excellent clinical reasons for using the device.

Given the good clinical justification, finance managers were able to negotiate with Commissioners off-tariff reimbursements to cover the cost of the prosthesis, as the item was tailor-made for the individual patient. But it took a chance item and a lot of investigation by finance into the clinical sphere to find all the relevant information.

The dialogue between finance and clinicians is precisely the model of collaboration that the trust is hoping to encourage – a collaboration which guarantees quality of care but eliminates the losses that were previously being incurred, and favours more effective use of healthcare resources.

Source: Ardentia (n.d.)

Management accountant in an NHS trust

For our patients on the costing system, we were able to demonstrate that we were bringing in women to have a mastectomy, and then some months later they'd come back and have a reconstruction under the tariff, and get paid £6,000 for that procedure. Our general surgeons and plastic surgeons wanted to work together in the theatre and do it all in one day [...] and you only get paid once under the tariff, so it costs you £12,000 but you only get £6,000, but because of PLICS we could demonstrate that to the PCT, and they've agreed to take it out of tariff and pay us separately for it.

Source: Chapman and Kern (2010, p. 8)

3.6 Chapter summary

- The analysis in this study found evidence to support the increased transparency to an organisation of its income and costs, necessary and crucial information to inform funding policy and valuable data in discussions with commissioners as benefits of PLICS. There was some evidence of it being used in the grouping and classification of patients. However, the evidence for dramatically improved clinical ownership of operating information as a benefit of PLICS is limited.

The NHS reforms might be expected to support the wider use of PLICS systems as trusts become more vulnerable to financial failure and more able to adapt their own pricing structures. For commissioners there will be a desire to share information, which may become a point of conflict.

4 Challenges to implementation

4.1 Costs of integrating and managing information systems

The move towards PLICS represents a fundamental shift in costing practices and generally requires the integration of many previously isolated systems. The reality is that in most NHS providers information sits on a range of different information systems, and the nature of these systems directly affects how easy it is to integrate them.

In most trusts this has been a major undertaking and is complicated further by the need to run the new PLICS in parallel with traditional accounting systems. Where the management of systems has been outsourced to other agencies, this adds further complications to integrating IT systems. Many of the set-up costs of PLICS can be attributed to the need to document the variety of systems, and retaining staff to maintain them (Jackson and others, 1999).

The cost of implementing patient-level costing varies by trust. In 2009, having implemented a PLICS system (Healthcare Financial Management Association, 2008), one NHS trust estimated the cost to be between £30,000 and £80,000 as a one-off investment in software, training and hardware (highly variable depending on the system chosen) plus annual maintenance, licence fee and ongoing support. The trust also pointed to the need to develop front-end systems to interrogate the data and produce reports, which added another financial cost of more than £50,000. Finally, it noted that the staff contribution was of one full-time senior costing expert and a dedicated senior data analyst, as well as time for clinicians to be involved and ‘champions’ within the organisation who can set aside dedicated time.

However, PLICS systems can grow as hospital information systems mature. The choice of what to include when implementing PLICS must be a pragmatic trade-off between obtaining the necessary granularity for accounting purposes, and designing a system that is effective and realisable in the short term. Attempting to produce PLICS data from systems that are not ready is likely to result in a fragile and inflexible system that requires significant remedial work in subsequent years.

Heavily integrated information systems also bring with them increasing information governance concerns, in terms of which departments have access to what level of patient identifiable data.

Head of financial developments and costing in an NHS trust

We were required to save 15% over two years, whilst living within the income generated and maintaining the level and quality of clinical activity. After undertaking a detailed profitability assessment and reviewing our costing methodologies, we soon established that our local database and spreadsheet based technology needed to change. Only then would we be able to give clinical services the level of costing detail they needed to interrogate service line reports.

Source: CACI (2009)

Once a PLICS system is established the extra granularity of information easily can run into many of millions of rows when handling whole-year data, and there are anecdotal

examples of trusts where the available computer power struggles to cope. Moreover, the sheer volume of information is a massive challenge for a trust's analytical capability, and typically only a small number of whole-time equivalent analysts will be assigned to interpret PLICS data (often this function does not extend outside the finance team). The case for more analysts could be made through funding from the savings identified by PLICS, but this is dependent on a trust's ability to detect and then achieve sufficient savings in the first place, which in turn is impeded by a lack of analytical resource devoted to PLICS.

4.2 Changing practice

It must be remembered that technology is a means to an end, and the advantages of PLICS data to detect, diagnose and address cost variations – either by changing practice or improving the costing process – are dependent on how it is used. Many organisations perceive activity-based costing (ABC) as tool for understanding costs rather than actively managing them (Lawson, 2005).

One of the key attractions of more detailed information about costs is that it enables a greater interaction with clinical decision-making. Why should clinicians know more about costs? Because they make the critical decisions about the inputs that individual patients receive. Clinicians are in the best place to consider key trade-offs that might be necessary to balance the types of inputs to care and the impacts on quality. The greater transparency of PLICS allows costs to be linked more meaningfully to clinical data, triggering clinical engagement from consultants who can now see costs linked to their individual actions (Chapman and Kern, 2010).

This rationale extends far beyond PLICS and Lord Darzi's review called for a general shift in the balance of control for services, giving clinical leaders of services ownership of budgets and accountability for the quality and financial performance of services (Darzi, 2009). Some have questioned the use of doctors' time on non-clinical matters such as budgetary management, and the guide to NHS finance for hospital doctors suggests that the balance should be 'not about turning doctors into accountants; it is about enabling doctors properly to engage with finance colleagues so as to make the best use of NHS resources for patients' (Audit Commission, 2009, p. 1).

Effective clinical costing needs to extend outside the finance team and build ownership in the wider business from the outset. Most important is the way that it is used to engage clinicians in dialogue about why the cost and time of treating the same condition can vary significantly (Chartered Institute of Management Accountants, 2008). The clinician directs the costs incurred during a patient's stay, and ensuring that they are considering cost issues depends upon the following (Beeson, 2010; Chartered Institute of Management Accountants, 2008):

- accepting the data presented (including the method used to trace costs)
- non-threatening engagement (for example, presenting initial discussions as 'Does this make sense?')
- translating costs into a language that they use – the 'currency of the clinician'
- implementing clinician feedback into future PLICS reports, allowing them to be corrected so that costing calculations become more accurate and the results more acceptable to clinicians

- the more costing data that is logged into PLICS, the more relevant and interesting the pool of data becomes.

The outcome of a successfully embedded PLICS system should be a shared understanding between managers and clinicians of how to detect, diagnose and address cost variations, either by changing practice or improving the costing process.

The example trust in this study pointed to one analysis where patients with similar conditions were having differing numbers of tests requested. After discussions with clinical directors three tests were removed from the order set, resulting in savings of around £15,000 a year.

Clinician in an NHS trust

We've been doing costing for 15 years, I don't know, whenever, when we first started looking at it, at what things cost, and here we still are sitting saying, 'Actually, nobody knows what things cost, there's a tariff that nobody agrees with', you'd think that over all those years they could have got it a bit nearer to being right.

Source: Chapman and Kern (2010, p. 4)

Head of performance intelligence

[The interactive PLICS reporting system] is used by Directors, Consultants, Clinical Nurses, Ward Sisters and other Senior Managers and is proving a real success for the trust. Managers are now able to answer any questions raised, present information that people have never been able to easily access before and respond to the requirements and information needs of front line staff.

The amazing thing about [the system] is that we can easily drill down to detailed patient and staff data which means resources, activity, costs and income can be attributed to individual patients wherever possible. We have never before had that level of valuable information across our key priority areas at our fingertips, all accessible from one central portal. It has changed the way we work!

Source: QlikView (n.d.)

4.3 Are patient-level information and costing systems cost-effective?

In addition to the individual benefits tested in Chapter 3, there is a rather simpler question about whether patient-level costing has been shown to lead to more efficient organisations, and whether the efficiency gains offset the costs on investment.

There are a number of possible approaches that an acute NHS trust can take to improve efficiency (Smith and others, 2012): given the current financial landscape, prioritisation and guaranteed results are vital. Should PLICS be prioritised ahead of other approaches to unlocking efficiency savings?

Although this is a simple question to ask, it is not easy to answer. It is difficult to find incontrovertible evidence of a simple link between better information and improved efficiency. The Chartered Institute of Management Accountants (2008) reported that some early adopters of PLICS found that it had refocused their attention on areas of costs that had not been previously considered to be major cost drivers; the Institute also describes how better information had diverted attention from the areas that traditionally

(and probably anecdotally) had been believed to be the areas of potential cost improvement.

A survey conducted of US and Canadian hospitals in 2004 (Lawson, 2005) found that the primary perceived benefit of ABC was cost control. Also, the primary concern about implementing the system cited as a reason for non-adoption was the cost of design and implementation, followed by the need to create new systems for data capture and processing.

The debate on the usefulness of more precise cost information – particularly of more detailed allocation of overheads – is ongoing, and an important factor is the enthusiasm with which managers mine the refined cost information for potential savings (Arnaboldi and Lapsley, 2005). There is evidence in the general ABC literature of organisations choosing the level of accuracy for their costing systems based on the minimum level required to drive change, rather than the best levels available (Merchant and Shields, 1993).

Debate about the cost-effectiveness of implementation is not limited to patient-level costing: Shekelle and Goldzweig's (2009) review of the cost and benefits of health IT noted that published evidence on the cost-effectiveness of health IT in general was weak. They point out that this is partly due to the complex nature of organisational health IT interventions interacting with a wide range of system components, making evaluation challenging. However, while this causes the cost-effectiveness of PLICS to be unknown, it is possible that improvements in patient-level accounting information (such as PLICS) will make it possible to perform detailed evaluation on health IT projects in the longer term.

For many trusts the decision to implement a patient-based costing system will depend on the confidence that they have in their existing management accounting information. Service Line Management (SLM) can be implemented without PLICS, and apportionment models can be stretched to create the illusion of patient-level costs. These models will be much less accurate than genuine patient level costs, but cheaper.

In addition, there are general questions about the reliability of any costing method in the hospital setting. Defining costs themselves is not straightforward when considering the full impact of fixed, variable, marginal, opportunity and depreciation costs and so on. If costs are imprecise by nature, is it effective to invest in expensive, high-precision costing tools? For example, when a major element in costs is ward staffing and this is largely driven by length of stay, then information about length of stay and bed day use – which is much easier to obtain – may allow efficient resource management.

We have seen that increasing detail in costing follows the trend for ever-larger electronic record systems. While the appearance of patient-level detail can be derived from constructing complex allocation models, it is far more powerful when individual hospital systems are connected together to track costs directly at patient level. Linking existing systems (and in some cases moving paper-based systems to electronic) is a substantial challenge, and encourages the proliferation of 'PLICS-like' systems that are heavily allocative, particularly in trusts eager to demonstrate a 'quick win'.

Much of this analysis focuses on whether PLICS is cost-effective for individual organisations. However, there is the question of whether PLICS is cost-effective for the

NHS as a whole; many examples of the ‘savings’ attributed to patient-level costs data have been through commissioners paying extra where the tariff does not cover the cost of treatment, rather than absolute cost savings within the provider.

Deputy director of finance in an NHS trust

The information has helped enormously to inform our discussions across a range of issues as we know which areas are profitable or not and, most importantly, we can start to explain why. It also helps to set our prices when tendering for new work, ensuring that we remain competitive.

Source: Bellis-Jones Hill (2008)

Description of an NHS trust’s day-to-day experience with patient-level costing

These days, clinical and general managers at [the trust] are busy running their own analyses of theatre utilisation and throughput, patient level costing and service line reporting.

[The information management and technology manager] says: ‘They can see whether other services or another clinician or different specialty or HRG [healthcare resource group] is profitable and what are the drivers for them being profitable. While a lot of these things might seem as though they are cost focused, the drivers are actually around performance issues.’

The trust is already sharing information externally. For example, it is working closely with the local PCT, sharing data on performance management and Commissioning for Quality and Innovation (CQUIN). [The information management and technology manager] says: ‘There is more transparency around the data and it is just much easier to communicate with them now than it was.’

In the immediate future, the priority is on building in the patient level costing and quality measures. [The information management and technology manager] says: ‘We are doing a lot on quality right now, building in meaningful outcomes about our safety and at the same time identifying areas where we can make efficiency savings, for example in non-pay expenditure or procurement expenditure.’

Source: Carlisle (2010)

4.4 Chapter summary

- The ease with which a PLICS system can be implemented strongly depends on the condition of a trust’s existing IT infrastructure. Set-up costs are in the order of £250,000 to 500,000: a significant investment, but not massive by the standards of most NHS trusts. However, these systems generate a massive volume of data and once systems are implemented, the trust will require finance and information analysts to mine the PLICS dataset in search of efficiency savings.
- The advantages of PLICS data to detect, diagnose and address cost variations – either by changing practice or improving the costing process – are dependent on how it is used. Many organisations perceive ABC as tool for understanding costs rather than actively managing them.
- Clinical engagement is crucial to the success of a PLICS system, and the system must be responsive to the needs of clinicians both as it is designed and in day-to-day operation. The credibility of the data presented to clinicians needs to be ensured to enable constructive conversations about potential efficiency savings.

- There is some debate on the ultimate cost-effectiveness of patient-level costing and what the optimum level of cost detail might be. However, the ABC literature does provide evidence that the approach is effective in industrial settings.

5 Future prospects for patient costing

The majority of patient-level cost analysis performed by the NHS focuses on the event-level, as discussed above. However, information also can be used to analyse patient-level costs over time, which has the potential to highlight further opportunities to enhance patient care and unlock efficiency savings. This chapter presents descriptive analysis of annualised patient costs, then suggests some prototype examples of how this might be applied in practice.

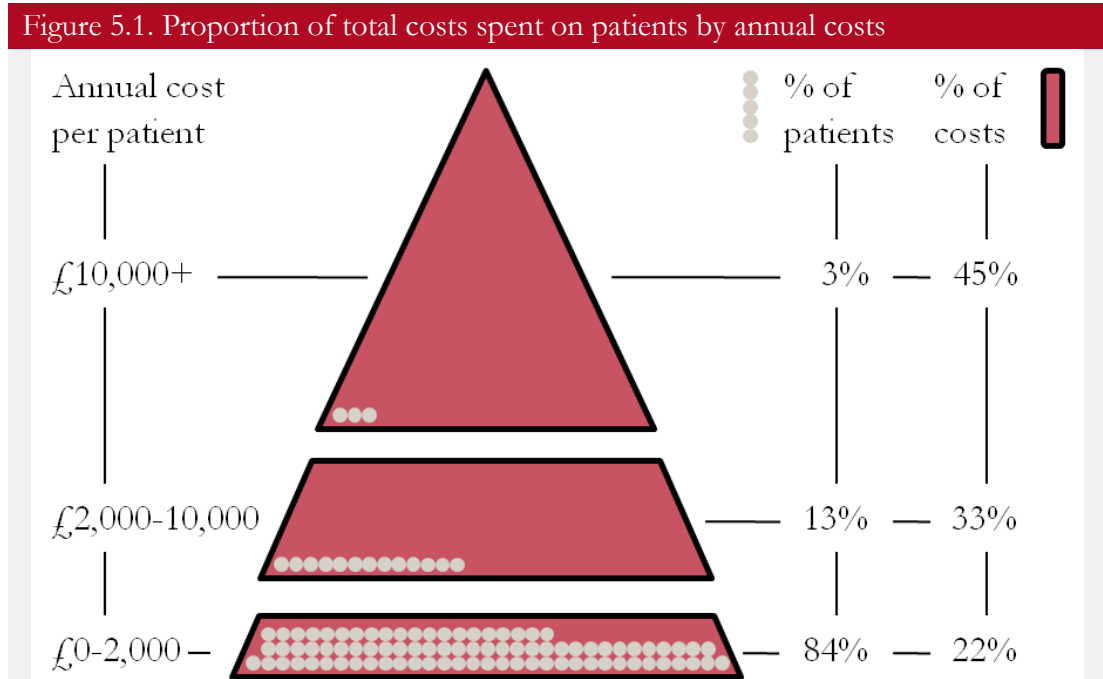
5.1 Costs of multiple care episodes

The average cost per patient day for 2008/09 (taking zero day stays, such as outpatient appointments or day-cases as half a day) was £484. The individual annualised costs are skewed very heavily towards low-cost patients, and the majority (60 per cent) cost under £500 (accounting for less than eight per cent of total patient costs). Figure 5.1 shows the cost distribution broken down into four distinct parts, as set out in Table 5.1.

Table 5.1. Contribution to total patient count and costs from each distribution segment

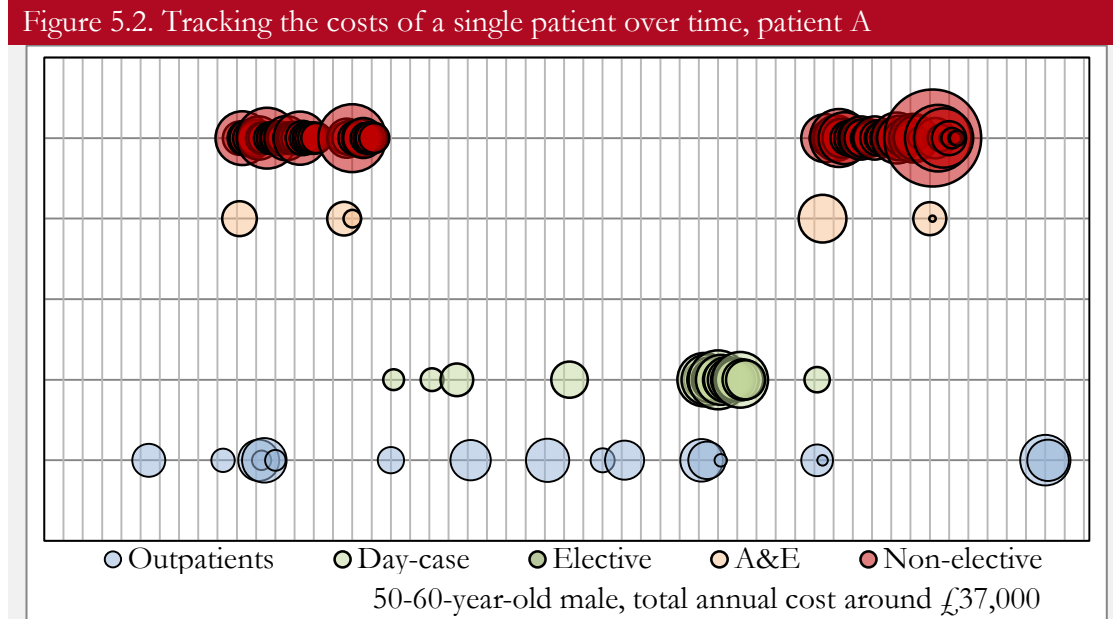
Patients costing between:	% total individuals	% total patient costs	Mean number of episodes	% inpatients	% inpatient costs
£0 and £2,000 a year	83.9%	22.3%	2.4	66.6%	14.5%
£2,000 to £10,000 a year	13.0%	33.3%	7.1	26.5%	34.2%
£10,000 to £100,000	3.0%	40.5%	19.0	6.8%	46.4%
£100,000+	0.04%	4.0%	20.6	0.1%	4.8%

Around three per cent of patients are responsible for nearly half the total patient cost; if only inpatients and their activity are considered this rises to seven per cent, but the overall picture remains similar. Clearly, if these patients can be identified before they become high-cost, there is potential to generate cost savings.

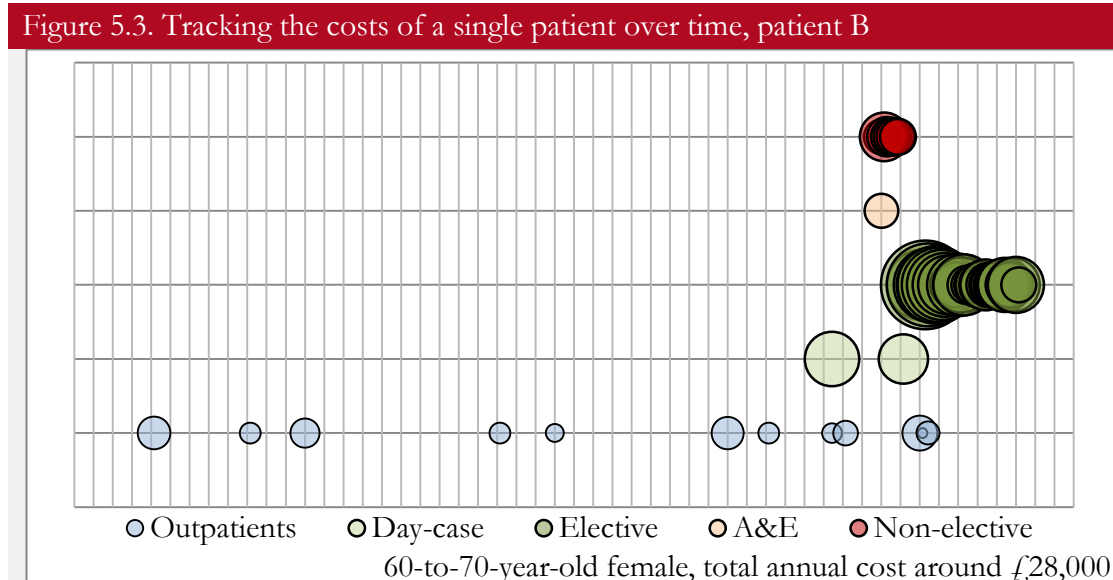


Note: Proportion of total costs spent on patients with annual costs of £0–£2,000, £2,000–£10,000 and £10,000+ (area of shape), with the proportion of all patients in annual cost band (dots).

PLICS data allows us to track individuals (or a cohort of individuals) over time and monitor usage and costs. This could be extended to the creation of information and cost profiles for use by teams of professionals or clinicians similar to those proposed by the Nuffield Trust, using activity linked across primary, secondary and social care (Nuffield Trust, 2011a). Figures 5.2 and 5.3 show the interaction that two individuals had with the trust in one year, where circles are daily activity and the size of the circle is proportional to cost. These charts are a powerful way to convey large amounts of information in meaningful ways. They also highlight where resources are consumed within the patient journey and could be used to construct patient-centred business cases.



This chart shows the daily interaction that one individual person had with the trust in one year (date and event labelling have been removed to protect anonymity). Each bubble represents a daily cost with colour indicating care setting, and size indicating cost. This patient has regular outpatient care of broadly the same cost throughout the period shown, as well as a concentrated period of day-case activity near the middle of the period. Their annual costs are significantly influenced by two periods of emergency admission, both of which consist of an emergency admission through A&E followed by an emergency readmission shortly after discharge. Most of the activity related to the same underlying medical condition.



This chart shows the same style of plot as Figure 5.2 for a 60–70-year-old female. This patient had regular outpatient care of broadly the same cost throughout the period shown and a highly concentrated period of inpatient activity towards the end of the period. On the basis of the specialties providing treatment, the outpatient and inpatient interactions appear to be unrelated.

Both individuals have a diagnosis of moderate liver failure but their patterns of resource use were very different. These techniques summarise a large amount of information, allowing the user to pinpoint quickly and easily where resources are consumed within the patient journey. They can be used to swiftly compare the pattern of resource use of two apparently similar patients and prompt discussion about differences between them.

Senior manager with responsibility for PLICS

I think the advantage of [PLICS] is that we drill down from the surface, down to the patient, and you can show the costs, my costs saying: 'This patient, [name], was in for this period of time, was in theatre five for three and a half hours, he had these pathology tests, he started off from [X] ward and he ended in [Y] Ward', and the clinician goes: 'Yeah, I believe that, that's what happened', and then you move the discussion away from 'I don't believe the numbers' to 'What are we going to do about the numbers?'

Source: Chapman and Kern (2010, p. 7)

5.2 Other developments

The overwhelming majority of analysis of PLICS data performed by the NHS is aimed at episode- or spell-level cost management. The example described earlier how some PLICS trusts are starting to use their data to examine the cost of care pathways, rather than single-episode events (Moore and Goodier, 2010).

Other uses for PLICS data include enhancing the accuracy of budget projections and linking integrated information from PLICS systems with mainstream accounting systems (the general ledger). In addition, groups of PLICS trusts will have the option to pool their data for use in benchmarking to help further identify areas of inefficiency. The concept of exploring patient costs over time can be expanded into primary care to give an integrated picture over time. The absorption of community services into provider trusts could be a key enabler for this, particularly if the acute trusts are using PLICS already.

It has been suggested that clinical commissioning groups might invest in PLICS to manage their own costs and to inform their 'make-or-buy' decision-making when commissioning new services. There is a precedent for PLICS in primary care, at a small scale at least (Engström and others, 2006).

Moreover, there is potential for developing the way that costs are monitored. Fully automated systems could generate patient-level costs more frequently, allowing day-to-day cost monitoring rather than quarter-to-quarter. If this frequency of data were to become possible, then costs could be amenable to some of the surveillance techniques currently applied to monitoring in-hospital mortality (Healthcare Commission, 2009), allowing immediate intervention if costs were deviating consistently from some expected value.

5.3 Future options for Payment by Results

In the example trust in this study, there was a poor match between the tariff and costs at the case level. However, the PbR system is evolving and there are many options available that potentially could increase the accuracy of the tariff, including the following.

- The recent change in its payment currency from HRG3.5 to the more detailed HRG4 and the general policy of ‘unbundling’ payments over time. Preliminary analysis using PLICS data suggests that the move to HRG4 improves accuracy in some HRGs but not others, and remains subject to distortion by extremely high-cost outliers.
- The process of unbundling means that the increasingly granular tariff carries the overhead of having to maintain an ever-expanding list of prices. Keeping these at an appropriate level will require a great deal of accurate information on costs and may prove unsustainable if PLICS is not widely adopted by providers or is adopted incompatibly. However, there is precedent in other countries of using only providers with costing systems that meet defined standards to inform tariff prices. In addition, there is the problem that unbundling reduces opportunities to make efficiencies against the payment by substituting one care process for another.
- Basing itemised tariff prices on national average costs is not the only option. In another approach, the Department of Health (2010a) has signalled a move to evidence-based ‘best practice’ tariffs. The initial selection is to be based on high-volume areas with significant unexplained variation in quality of clinical practice and clear evidence of what constitutes best practice. However, ensuring that these keep pace with developments in clinical practice and cost over time will be a significant challenge. To improve accuracy, the tariff price could be set around modal or median costs, and rather than pay extra in the assumption that cheap cases will subsidise expensive cases, operate a stop-loss system where unexpectedly high cost cases (perhaps those that cost upwards of a 200 per cent tariff) are met from a shared risk pool. This scheme excuses itself from reimbursing all cases in order to focus on funding the more stable majority of cases more accurately, with special provisions for funding extreme cases.

An important question is whether an itemised tariff can be relied upon to drive efficiency where the match to real costs is poor. There is the suspicion within the NHS that changing surpluses against tariff is more related to variation in prices than in their own costs. Exploring the accuracy of the tariff also leads to a wider question of what the intended function of the tariff is: is its purpose as broad remuneration, or to match individual cases as closely as possible? If its function is not to match individual cases, can it ever facilitate a transaction-based, market-like system to drive provider efficiency?

5.4 Chapter summary

- There is a scope to extend the additional detail of PLICS systems to include a wider range of health service encounters. The present authors’ original ambition for this work was that one day it would proceed to include events in other care settings. Such an approach could lead to much better approaches to managing patient care rather than individual services.
- In addition to enabling the exploration of cost variations at episode level, the PLICS data allow us to describe variation in total annual patient cost. This revealed that there is a huge range of patient costs: the average annualised cost per patient was £1,648 but with a standard deviation of £5,809. The individual annualised costs are skewed very heavily towards low-cost patients, and the majority (60 per

cent) cost under £500 (accounting for less than eight per cent of total patient costs). Around three per cent of patients are responsible for nearly half the total patient cost.

- PLICS data can be used to create patient-level information and cost profiles that can be used to swiftly compare the pattern of resource use of two apparently similar patients, and prompt discussion about the differences between them. Patients with similar diagnoses and costs can have very different patterns of resource use.

6 Conclusions

This study has explored the extent to which is PLICS used in the NHS, how trusts are using it and planning to use it, and what PLICS' potential is to increase efficiency in the NHS.

The analysis in this study has found evidence to support the belief that patient-level costs offer increased transparency of income and expenditure. In particular, the ability to analyse the sources of cost variations in more detail clearly offers a valuable tool for any organisation wanting to audit its use of resources. However, it is not always obvious how an improved capability with information translates into practical changes in the way that an organisation behaves.

In terms of the application of PLICS we would note the following.

- The development of hospital costing tools in England has been shaped by the context of the NHS. We have seen that the sophistication and form of costing systems align themselves to changes in financial flows within the health care system, rather than demands for greater efficiency.
- About two-thirds of NHS trusts claim either to have PLICS or are developing it. Advances in the capability of IT systems and the ability to link information are making it easier to move towards more detailed information at patient level. However, the gradual evolution of information systems may take some time. If a trust is considering a major overhaul of its IT and/or costing systems, it would be very effective to introduce PLICS at that point for a marginal cost.
- In trusts where PLICS was available it appeared to have been particularly valuable in discussions with commissioners where detailed costing is presumably important evidence in justifying prices.
- No systematic evidence on savings could be found. Anecdotal evidence suggests the potential savings appear to be in the order of hundreds of thousands rather than the multiple millions required to make a noticeable contribution to the challenge of saving £20 billion by 2014. However, the savings found through PLICS will accumulate over time.
- In the example trust in this study it was observed that the PbR tariff was unreliable for reimbursing individual cases cost. It only reimburses 'accurately' (within a margin of 20 per cent) for one in six of cases in the trust studied. The reaction of others to this finding suggests that it is probably not atypical among trusts.
- One of the key reported benefits of PLICS data is the potential to improve engagement with clinicians. In theory PLICS offers a way to combine costs with a level of patient detail with which clinicians will be familiar. However, the evidence for dramatically improved clinical ownership of operating information as a benefit of PLICS was limited.

The current NHS policy environment is dominated by the need to make efficiency savings and implement health service reforms, both of which will have implications for the future of PLICS in the NHS.

The changes outlined in the White Paper *Equity and Excellence: Liberating the NHS* (Department of Health, 2010c) signal important changes for NHS providers. In addition to greater independence from central control, there will be a much tougher position on overspending. Therefore, the consequences are much greater for providers not understanding and being in control of their costs, making adoption of PLICS systems more attractive.

Based on the evidence presented in this report, the following recommendations are made for policy-makers, NHS trusts and the system of provider payment.

For policy-makers:

- There may be other ways in which choices at the centre can encourage the adoption of PLICS, or at least better costs data. For example, the body that decides the rationale for price setting (either Monitor or the NHS Commissioning Board) could follow the German model of using only the costs from PLICS trusts to inform prices. This would encourage PLICS implementation as trusts vie to be part of the debate on prices, and arguably improve the accuracy of tariff prices.
- Given the importance attached to improved clinical engagement as a potential benefit of PLICS, it would make sense for policy-makers encouraging the introduction of PLICS to prioritise the collection and publication of specific, demonstrable examples of improved clinical engagement.
- The advent of PLICS means that providers have a very advanced understanding of their costs, something to which commissioners are not guaranteed access. This creates information asymmetry, which can have a detrimental effect on the efficiency of a market. To guard against this, policymakers could mandate some level of cost information-sharing between all providers and commissioners, possibly following the model of regulatory accounts used in the utilities industry.
- If providers shift their behaviour from income maximising to profit maximising, it is possible that some providers may try to reduce their activity in areas that are not profitable. Continuity of access to care must be ensured for the public.

For NHS providers:

- Traditionally, trusts have avoided deficit by growing their activity. However, this is unlikely to be sustainable and constraints on commissioner spending may well see a reduction in overall acute activity. Inevitably, providers will begin to consider their profitability in detail. Inaccuracies in the tariff, case-mix effects and natural fluctuations will be possible causes, but trusts will need PLICS to assess the degree to which each is a factor. Trusts without PLICS may resort to cutting whole services if they are not profitable, without being able to locate where the losses are generated.
- Those trusts with PLICS have an advantage in terms of their ability to lobby on and inform future tariff development. Trusts will need a sound understanding of their costs if they are to make a case to Monitor to be paid above tariff for a designated service.
- Where PLICS is available it should be used with care and intelligence. The ability to link expenditure directly to members of staff has the potential to be damaging and disruptive if abused. This can be avoided by focusing on PLICS

as a trigger for further explanation, not a definitive judgement in itself, and encouraging clinical engagement throughout the process. There are examples of this being achieved through the use of ‘clinical champions’.

For the system of provider payment:

- The accuracy of reimbursement via PbR should be improved. There are many options available that potentially could increase the accuracy of the tariff, such as the current trend of increasing the level of detail in prices, deriving prices from a subset of trusts known to have reliable costing systems, the use of theoretically derived ‘best practice’ prices or special arrangements to handle high-cost outliers. However, many of these have their own drawbacks and each must be considered carefully.
- An alternative to an itemised tariff that could be considered is a move to person-based (capitated) annual tariffs based on patient characteristics, where the provider receives a set fee for providing all secondary care required during the year. This would encourage integrated care packages, avoid some of the more toxic elements of a fee-for-service scheme and potentially improve accuracy due to the reduced complexity of pricing. This is similar to the approach being developed for mental health PbR (Department of Health, 2012).
- Any perverse incentives in the system must be minimised. For example, the analysis in this study suggests that the tariff may be systematically overfunding low-resource cases and underfunding more resource-intensive ones. This has the potential to encourage providers to focus on profitable simple procedures at the expense of more complex loss-making activity. Also, in most current NHS systems, funding streams differentiate between acute episodes and community or primary care-based preventive interventions; currently there are few financial incentives for the acute hospital to avoid admissions.

In short, patient-level costing is a powerful tool for health care organisations. When implemented well it provides a vast array of useful and accurate data on distributions of expenditure and profitability against income. However, it then relies on the provider to make use of this information in terms of influencing practice to become more efficient and setting prices. There is limited evidence for cost savings as a result of PLICS, and those that are documented involved relatively small amounts. It would seem that PLICS is a long-term investment rather than a short-term saving. Despite this, trusts without access to high-quality cost information will find it challenging to ensure their efficiency savings are cutting waste, not care.

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Facsimile: 020 7631 8451
Email: info@nuffieldtrust.org.uk



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