

# Can NHS hospitals do more with less?

*Research report*

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## The Quest for NHS Efficiency

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The NHS is facing one of the most significant financial challenges in its history, with efficiency savings of at least 4 per cent per year now required. This comprehensive programme of research aims to help the NHS respond to the financial challenges ahead by examining how health services can improve productivity and deliver more for less. It is informed by rigorous analysis of existing UK and international research evidence, and sets out practical recommendations for managers, clinicians and policy-makers about how the NHS can improve productivity and respond to what has been dubbed the 'Nicholson challenge'.

An accompanying research summary, based on this report and providing a policy analysis, has been produced. To download the summary, or further copies of this report, visit [www.nuffieldtrust.org.uk/publications](http://www.nuffieldtrust.org.uk/publications)



Find out more online at: [www.nuffieldtrust.org.uk/efficiency](http://www.nuffieldtrust.org.uk/efficiency)

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# Foreword

The financial challenge facing the UK's health services over the next four years, combined with the relentless rise in the demand for services, means that it is imperative that the NHS delivers more for less. Simply maintaining real spending and the current level of activity will not be enough. Substantial improvements in productivity are needed if new demands are to be met, new innovations are to be funded and significant shortcomings in the quality of some services are to be remedied.

The authors of this report studied UK and international literature on hospital efficiency, and surveyed senior managers and clinicians in six hospital trusts that had been 'turned around' following financial difficulties. They found much research evidence on what measures are associated with higher productivity in hospitals. They gleaned practical lessons from the managers about what successful steps had been taken to improve efficiency in their financially challenged hospitals.

Their findings highlight the crucial roles that good leadership and effective clinical and general management play in driving hospital efficiency improvements. They underline the importance of creating an external environment that will support and incentivise hospital managers in the battle for greater productivity. They also point to some of the many ways in which the processes of delivering hospital services can be reshaped to raise productivity. There are important lessons here for the new local clinical commissioning groups and the national NHS Commissioning Board.

This report is part of the Nuffield Trust's Quest for NHS Efficiency programme. An accompanying research summary highlights the report's key findings within the context of the current Government health reforms. The publications and other resources, together with more information on our work in this area, can be accessed at [www.nuffieldtrust.org.uk/efficiency](http://www.nuffieldtrust.org.uk/efficiency)

*Judith Smith*  
*Head of Policy, Nuffield Trust*

# Executive summary

## Aims

The NHS needs to make unprecedented efficiency savings of £20 billion over the next four years (4 per cent per year) to bridge the gap between a virtual freeze in real-terms funding, and rising demand. Its chances of doing this will depend to a significant extent on hospitals improving productivity and efficiency, since hospitals account for the bulk of health spending and have seen a fall in their quality-adjusted productivity in recent years. This report seeks to understand the factors that determine efficiency within hospitals and how hospital trusts can best make cost savings by improving efficiency, based on UK and international experience.

## Methods

The report is based on two separate strands of investigation. The first was a review of UK and international research literature about ways to improve hospital efficiency.

The second was fieldwork, consisting of a small survey of senior executive managers and clinicians in trusts that have been ‘turned around’ following financial difficulties, without reducing their quality of care. The researchers also interviewed a small number of national experts, to test emerging ideas and conclusions.

## The determinants of hospital efficiency

The hypothesis adopted in this study is that the determinants of hospital efficiency fall into three distinct areas:

- the external environment: this includes such factors as the financial pressure on hospitals; competition and other market forces; performance monitoring and management; and the availability of cost-effective treatments and technologies
- hospital management: this covers such factors as leadership and the use of effective management practices; cooperation between managers and clinicians; and the speed at which new and cost-effective treatments and technologies are adopted
- hospital operational processes: these include the control of labour costs; the use of nursing skill-mix; shortening length of stay; and measures intended to reduce errors and increase quality.

## Findings: the external environment

*Financial pressure:* One of the most striking and consistent findings from NHS history and the international literature is that financial pressure on hospitals is associated with improvements in ‘crude’ productivity, although its impact on quality is less clear.

However, increased activity has been the main source of hospital efficiency gain during previous contractions in the NHS. It may not be possible to increase activity in the coming financial contraction, if clinical commissioners assert themselves, pushing



for the shift towards ‘care closer to home’, if the tariff is reformed to bear down on additional volume, and if pressure is applied to maintain or raise quality. The fieldwork for this study suggested that it is much easier to increase activity than to take costs out of the system; but going forward the emphasis must shift towards cost containment rather than revenue growth.

*Competition, payment, and performance management:* The NHS internal market is likely to support the pursuit of hospital efficiency, since there is evidence that strong commissioning arrangements, an element of competition, and case-based payment systems such as England’s Payment by Results are positively associated with hospital efficiency. However, the kind of competition matters. UK studies have suggested that while competition on price may eventually bear down on costs it may also impact on quality. There are signs that the publication of information on quality can help to raise standards, at least for the activities highlighted. However, it is too early to judge the impact of ‘pay-for-performance’ schemes such as England’s Commissioning for Quality and Innovation (CQUIN).

*Technological change:* Although financial pressure tends to improve crude productivity, it is the introduction of new technology that holds promise for improving quality-adjusted health care over the longer term, by extending treatment possibilities and by enhancing outcomes. Yet it is difficult to reap net cost savings from new technologies. Although there are examples of medical advances representing cheaper substitutes for existing therapies, it is more common for them to lead to treatments for conditions for which there were previously no (or no effective) therapies, and for these to be introduced at premium prices.

The fieldwork for this research found good examples of IT and other innovations being introduced to ‘turnaround’ trusts to secure efficiency benefits. But the diffusion of many cost-effective technologies varies significantly across the NHS hospitals, with profound consequences for outcomes. The National Institute for Health and Clinical Excellence has a vital role to play in guiding NHS organisations towards cost-effective technologies.

## Findings: hospital management

*Leadership and clinical engagement:* Good leadership, effective management practices and strong clinical engagement are the cornerstones on which hospital efficiency can be improved. The indicators of good management include human resource practice, such as setting clear performance targets and rewarding staff for meeting them.

There is a firm belief among NHS executives that embedding an ongoing pursuit of efficiency relies on the delegation of responsibility and accountability for budgets to business units within a hospital, with service-line reporting being seen as one of the most powerful tools for engaging clinicians in discussions about cost and quality. Recognition of and support for good management will be critical in achieving efficiency gains in NHS hospitals.

*Process re-engineering and pathway redesign:* Over the past two decades, a great deal of attention has been paid to ‘process re-engineering’ in hospitals, drawing on the experience of private firms. Studies have however shown that attempts to re-engineer whole organisations have met with limited success. The fieldwork for this research suggested that several ‘turnaround’ trusts had re-engineered pathways, and there is

some evidence that re-engineering can work at the departmental or ward level, and that it should be targeted on those services with high reference costs and/or concerns about quality.

### Findings: hospital operational processes

At an operational level, there are few quick and simple fixes for hospital inefficiency. Achieving efficiency requires the diagnosis of multiple sources of inefficiency followed by adjustments on many fronts to the quantity and quality of care, the volume and skill-mix of staff, and the technology used to deliver care. There is a vast amount of knowledge about how to extract efficiencies from hospitals. What is much more difficult is to put these into practice in a concerted and sustained manner. Significant clinical and general managerial time and effort will be required, in a context of focused business planning and organisational development.

*Length of stay and bed reductions:* Reducing length of stay and increasing day case treatment have been strongly associated with past efficiency gains. International evidence suggests the NHS still has some way to go in terms of reducing its average length of stay, and that moving specialist medical staff into the community and focusing on long-term care may be necessary to achieve this. Eventually, further reductions in bed numbers will be needed if the NHS is to remain efficient; both the NHS Confederation and The King's Fund have argued that it would be better if whole sites closed or had radical changes to the service they deliver, even though this is likely to be unpopular with communities and could restrict competition and choice. The picture is complicated by the Private Finance Initiative (PFI), which has created some up-to-date and efficient but inflexible NHS capacity. The large fixed costs associated with PFI facilities may mean that rationalisation is more likely on non-PFI sites.

*Mergers:* Studies have suggested that the impact of hospital mergers on efficiency is mixed, because any management failure to focus on the human impact of major change can bring about a dip in performance. Likewise, there are limits to the economies of scale possible through mergers; these may be better achieved by cooperation between hospitals to reduce the duplication of services and concentrate buying power.

*Quality initiatives:* Quality and efficiency seem to be positively correlated. This may be because getting things right first time is good for patients and good for costs; although it is also likely that high quality and low costs are associated with sustained good management and the speedy diffusion of cost-effective technologies. The fieldwork identified several examples of quality initiatives that had led to efficiency gains, with infection prevention being one of the most significant examples. It is likely that reducing harm to patients will be a key area for efficiency gain in the coming years.

*Improving staff productivity:* Staff costs are the first place to look for efficiencies. Key strategies for increasing staff productivity include: reducing staff numbers where there is relative 'slack', stopping the use of agency staff, securing better management of overtime and sickness absence, and (more tentatively) making skill-mix changes that preserve a rich clinical skill-mix when reducing overall numbers. Reducing the pay bill, through reductions in staff and skill-mix reviews, are strategies that NHS managers expect to use.

## Conclusions

There have been a number of technical limitations to this study. It has confronted issues with multiple data sources, changes in reference costs and interpreting Care Quality Commission scores in trying to compile a set of statistics that reliably demonstrate changes in a trust's productivity and efficiency over time.

It has found that the measurement of quality in the literature on hospital efficiency is invariably missing or incomplete. And it has found that studies of the determinants of efficiency are largely confined to observational studies, with an absence of controlled trials or longitudinal studies that link efficiency to its supposed determinants over time.

Despite this, there is evidence to suggest that there are considerable efficiency gains yet to be made by the NHS in England. There are also indications from the research presented in this report as to what measures could be taken to secure such gains.

More specifically, the research suggests that the financial and regulatory measures set out in the last three operating frameworks for the NHS in England and the quality, innovation and productivity elements of the Department of Health's Quality, Innovation, Productivity and Prevention (QIPP) agenda provide a sound basis for approaching efficiency improvements in English hospitals over the next four years.

However, one of the strongest findings was that good leadership, and effective general and clinical management, are both crucial for making productivity gains. So it must be a worry that the current major reform and reorganisation of the NHS risk distracting managers and clinical leaders from this important and pressing agenda.

# 1. Introduction

## Context

The long years of increased spending are over for the NHS. From enjoying an average growth of nearly 7 per cent a year in real spending since the beginning of this century, the NHS in England is facing what will be virtually a real-terms freeze in funding for the four years from 2011/12 to 2014/15. It is required to deliver formidable efficiency savings of up to £20 billion, which should be released into funding front-line services for patients (Department of Health, 2010f).

At a first glance, the omens for making such efficiency savings do not look good. The NHS can boast many achievements in recent years, but until very recently increased productivity was not one of them. Office for National Statistics data indicate that UK health care productivity fell by 3.3 per cent between 1995 and 2008, an annual average decline of 0.3 per cent (Penaloza and others, 2010). Most of this decline happened in the hospital sector, and most happened during a sub-period when there was unprecedented growth in funding. Although NHS productivity rose by 0.7 per cent in 2009, it still remained 2.7 per cent below its 1995 level (Hardie and others, 2011). Benchmarking data reveal the distance that the NHS needs to travel to reduce variations in day case rates, length of stay and other productivity indicators.

The NHS now faces what NHS Chief Executive David Nicholson has described as 'the toughest financial climate it has ever known' (Department of Health, 2009a: p2) at a time when demand is expected to continue rising. The volume and quality of NHS care is threatened if the productivity decline is not put into reverse – especially in the hospital sector. The Department of Health has said that it is 'difficult to grow capacity and productivity at the same time' (Department of Health, 2010a). Now that a period of contraction is upon us, will productivity gains be any more achievable, and can they be designed to contribute to the cost savings that are required?

Much depends on the NHS's starting point in terms of efficiency. There is some international evidence that the health system in the UK is less efficient than the health systems in the majority of other Organisation for Economic Co-operation and Development (OECD) countries, including four out of the five countries which have health care institutions that are most like those of the UK (Joumard and others, 2010). It is small consolation, perhaps, that there is evidence from within the UK that the NHS in England is relatively efficient compared with the NHS in the rest of the UK (Connolly and others, 2010).

At a glance, the financial outlook for the NHS may appear relatively secure, at least in comparison to other areas of public sector spending, with a commitment from the Coalition Government to increase health spending in real terms, if only marginally, in each of the next four years.

However, such funding will not meet the growing demands on the NHS arising from advances in medical technology, rising expectations and demographic trends; neither

will it meet the cost of new priorities such as the NHS reorganisation which has been ordered by the Coalition Government (Department of Health, 2010b). In order to fund these demands, the NHS will be required to find, as mentioned above, efficiency savings of up to £20 billion (about 20 per cent of total NHS spending in England) in the four years from 2011/12 to 2014/15 (Department of Health, 2010f). The Department of Health's thinking on improving efficiency rests on, among other things, avoiding some hospitalisation by caring for more patients close to home, using the tariff payment system to lower hospital prices, and raising productivity (Department of Health, 2009a).

The search for greater productivity should be combined with the pursuit of quality, innovation and prevention, as set out in the Department of Health's Quality, Innovation, Productivity and Prevention (QIPP) agenda (Department of Health, 2010d; 2010f). The funds released will then be available to be recycled into financing new demands and the changing priorities for the NHS (Department of Health, 2009a; 2010c; 2010f).

In practice, much rests on the ability of the acute hospital sector – the biggest spender of NHS resources and the main locus of the recent productivity decline – to release resources by improving efficiency. It appears that acute hospitals will be facing a double squeeze: on the rate of growth of the levels of activity that they can expect to provide (with a proposed shift of more care to the community); and on the prices they receive for services (Department of Health, 2009a; 2010f).

## This report

With this challenge in mind, this report seeks to understand how acute and mental health trusts can best make cost savings by improving efficiency, based on evidence and past experience of efforts to do this. It is part of the Nuffield Trust's Quest for NHS Efficiency programme of research.

The focus in this report is almost entirely on efficiency *within* hospitals. The study has not looked systematically at whether the NHS or, indeed, hospitals would become more efficient if there were, for example, more or less primary or long-term care. Neither has it looked at the right role for hospital services on a multitude of patient pathways. In other words, this particular investigation is focused on some questions – albeit large questions – involving sub-optimisation within health care as a whole. As has been noted above, recent health policy in Britain has favoured shifting some care from hospitals to settings closer to home (Department of Health, 2006; 2009a). The evidence from other work undertaken by the Nuffield Trust (for example, Smith and others, 2009; Blunt and others, 2010) provides strong hints that there is potential to improve efficiency by shifting more care from hospitals into primary care or integrated care settings, and by reducing avoidable hospitalisation.

Input prices have been assumed to be given to NHS hospitals – partly because wages and salaries, and (indirectly through the Pharmaceutical Price Regulation Scheme) the price of drugs, are respectively partly and wholly negotiated centrally in the UK.

Turning to our research methods, this report is based on two separate strands of investigation:

1. A review of the British and international literature on the scale of hospital inefficiency, and ways to improve it – the results of this review are included in this report.
2. Fieldwork consisting of a survey of senior executive managers and clinicians in six hospital trusts which, following financial difficulties a few years ago, appear to have been ‘turned around’, improving their efficiency without apparently reducing the quality of care. We also interviewed some experts. The results of these surveys are reported in boxes in Chapters 4–7.

More details on the research methodology for each strand of investigation are reported in Appendix A.

The report is organised into seven further chapters and three appendices. Chapter 2 is concerned mainly with concepts and measurement of hospital efficiency. Chapters 3–7 present the evidence from the literature review and the fieldwork survey. More specifically, Chapter 3 covers external influences on hospital efficiency, Chapter 4 deals with hospital management issues, Chapter 5 with the adoption of new technology, Chapter 6 with hospital operational processes, and Chapter 7 with staff productivity. Chapter 8 draws together some lessons for the NHS, as it faces the requirement to release cash by making major improvements to its productivity.

Appendix A details the research methodology and includes the names of the trusts visited. Appendix B lists the names of all those interviewed as part of the fieldwork. Appendix C contains additional text on concepts and measurement of efficiency.

### **Limitations to this investigation**

There are various technical limitations to this study. Efficiency is, roughly speaking, the ratio of outputs to inputs, or costs. Ideally, the measurement of outputs should include outcomes or the quality of care, as well as its volume. However, the literature review has come up against the fact that invariably, measurement of the quality of health care is either missing or incomplete. We have used the term ‘crude efficiency’ to denote measures of efficiency where quality adjustment is missing entirely. Moreover, most of the literature contains, at best, evidence on relative efficiency, because it adopts a benchmarking approach. In addition, the literature on the determinants of efficiency is confined to observational studies – there are no reports of controlled trials. Finally, there is a dearth of longitudinal studies that link efficiency to its postulated determinants through time.

## 2. Hospital efficiency and its determinants

This chapter addresses the conceptualisation of hospital efficiency and the formidable difficulties that attend its measurement. It moves on to suggest that efficiency is very variable among hospitals according to the best available evidence. Also, hospital efficiency has been deteriorating since 2001 in the UK. The chapter concludes by presenting a conceptual framework of the determinants of hospital efficiency.

### Capturing efficiency

Descriptions of concepts of efficiency as they apply to this project are contained in Appendix C. The project is concerned with ‘productive efficiency’, which combines ‘technical efficiency’ or ‘productivity’ (broadly speaking, maximising the ratio of outputs or outcomes to inputs) and ‘cost-efficiency’ (minimising the monetary cost of purchasing the output or outcomes produced by a technically efficient mix of inputs). However, as mentioned previously, input prices have been assumed to be given to hospitals.

A discussion of measurement issues is also in Appendix C. Some of the best literature on the determinants of hospital efficiency employs ‘frontier’ methods to measure efficiency: that is, the most efficient hospitals (on the frontier) are identified and the distance that other, less efficient hospitals lie from the frontier is quantified in percentage terms. If possible, the measurement of output should include the quality<sup>1</sup> as well as the volume of health care provided. That is, it should include effectiveness – the impact of health care activities on health outcomes and patient experience or satisfaction. However, in practice, quality measurement is invariably incomplete or lacking entirely (in the latter case, the measurement of productivity or efficiency is ‘crude’).

(An outline of the difficulties this study encountered measuring the efficiency of NHS trusts in preparation for and during the fieldwork is included in Appendix C.)

### The extent of hospital inefficiency

The development of frontier techniques for measuring inefficiency (see Appendix C) has generated a large literature on the measurement of efficiency and productivity in health services. As mentioned previously, at the international level, Joumard and others (2010) have used frontier techniques to examine the efficiency with which OECD countries turn health care resources into longevity, after controlling for other determinants of mortality. Their findings suggest that the UK is less efficient than many other OECD countries, including four out of five of the countries which have health institutions most similar to those in the UK. This study relates to whole health systems, and therefore is limited by the highly aggregate data which were used and the difficulties of comparing outcomes across countries. Several studies that have not used

<sup>1</sup> This report adopts the healthcare quality framework set out by Donabedian (1966). In particular, it embraces the idea that outcomes represent the ultimate validation of the quality of care.



frontier techniques suggest that the NHS in England is relatively efficient compared with the rest of the UK (see, for example, Connolly and others, 2010). A recent paper has suggested that there are considerable variations in (quality-adjusted) productivity in hospital and community health services across English health regions – the least efficient region is 6.5 per cent less efficient than the national average (Bojke and others, 2010).

In principle, more accurate measurement of efficiency should be possible for entities that are smaller than nations or regions. Hollingsworth (2008) reports finding 317 published papers on frontier efficiency measurement of productive units in health care. About half of these studies concern hospitals, most utilise some measure of patients treated as output (that is, they are ‘crude’), many are American and most are cross-sectional rather than longitudinal.

Hollingsworth has prepared some summary statistics from the findings of these studies. The mean efficiency across all the hospital studies is 83.5 per cent (where maximum efficiency = 100 per cent). The mean efficiency in US hospitals is 82.6 per cent and in EU hospitals is 86.0 per cent. Interestingly, the mean in public hospitals (at 88.1 per cent) is higher than that in for-profit hospitals (at 80.1 per cent), and even higher than that in not-for-profit hospitals (at 82.5 per cent). There is considerable dispersion around these means, suggesting significant potential for improvements in efficiency. However, Hollingsworth points to the many difficulties of measuring efficiency by using frontier techniques, and counsels against drawing very firm operational conclusions at this stage in the development of the literature.

Hollingsworth does not summarise British studies. However, Maniadakis and others (1999) found mean efficiency levels between 86 per cent and 92 per cent in Scottish hospitals between 1991/92 and 1995/96, and Hollingsworth and Parkin (2003) found mean efficiency levels of 86.3 per cent and 90.7 per cent in acute hospitals in one English region in 1994/95 and 1995/96, respectively. The standard deviations of the English efficiency scores in these two years were 13.9 per cent and 11 per cent, respectively, suggesting that there was much larger scope for efficiency improvements in some hospitals than in others. Indeed, the full range of efficiency scores was from about 20 per cent to 100 per cent.

## Changes in hospital productivity

Estimates of trends in productivity have been available for the Hospital and Community Health Services (HCHS) as a whole in England for a period beginning in 1974. From 1974 to at least 1999 (judging by Smee, 2005) these estimates were based on the so-called ‘cost weighted activity index’, which lacked quality adjustments, and on an index of the volume of inputs to the HCHS. This measure of crude HCHS productivity, prepared by the Department of Health, remained fairly flat for various periods between 1974 and 1999, but rose sharply between 1982 and 1987, following the introduction of performance measurement and general management into the NHS in 1983. It rose again briskly between 1992 and 1995, following the introduction of the NHS internal market reforms and, it should be added, the setting of explicit targets by the Department of Health for efficiency gains. In all, the index rose about 20 per cent between 1974 and 1999 (Smee, 2005). Presumably, if there had been quality adjustment, the index would have risen even faster, since there was significant technological change over the period.



The Office for National Statistics now publishes estimates of productivity trends for the NHS with quality adjustments. The preferred quality adjustments are based on the following:

- survival
- health gains and waiting times in hospital
- primary care outcomes
- patient experience.

As has been mentioned above, recent estimates suggest that quality-adjusted productivity for the HCHS fell by 3.3 per cent between 1995 and 2008; an annual average decline of 0.3 per cent, despite the fact that the estimated quality component of output rose over the period. Virtually all of the fall in productivity occurred between 2001 and 2008 – the period of rapid expansion of the NHS (Penaloza and others, 2010).

Most of this fall appears to have been due to declining productivity in the HCHS. Crude HCHS productivity fell by 16.7 per cent over the period; an annual average decline of 1.4 per cent (Penazola and others, 2010). Unfortunately, quality-adjusted productivity estimates are not available for the separate components of the NHS.

## Determinants of productive efficiency in hospitals

There are significant bodies of both empirical evidence and professional judgement as to what determines variations in ‘efficiency’ across hospitals. Measures of ‘efficiency’ in the literature vary widely, ranging from ‘crude’ measures (lacking quality adjustment), such as operating profit or loss (in the US) and average cost per case across the hospital, adjusted for case mix using diagnosis-related groups (DRGs) or health care resource groups (HRGs) (in many countries), to quality-adjusted measures which allow, if only partially, for the quality as well as the volume of output. Efficiency in a particular hospital is often measured *relative* to that in a benchmark hospital (or group of benchmark hospitals), which appears to be most efficient. In what follows, particular attention has been paid to studies that use ‘frontier’ analysis to estimate which the most efficient hospitals are, and how *relatively* inefficient the remaining hospitals are (see Appendix C). Quantitative exploration of what determines relative efficiency can then take place using methods such as regression analysis (see Appendix C).

The determinants of productive efficiency in hospitals may lie partly in the hospitals themselves and partly in the external environment – particularly the economic environment. Figure 2.1, which is used to organise the structure of the remainder of this report, elaborates on these hypotheses. Hospital productive efficiency – which depends on the ratio between outputs and costs – lies at the centre of the figure. It is likely to be associated (in the next concentric ring) with certain methods of production or processes, such as providing a high proportion of elective surgery on a day case basis. The adoption of efficient processes, in its turn, is likely to depend (in the next concentric ring) on factors such as:

- effective leadership
- management and organisational culture

- doctors' engagement
- staff skills and engagement
- the speed of adoption of cost-effective, technological change.

Lastly (in the outermost concentric ring) the performance of the hospital is likely to depend partly on external factors such as:

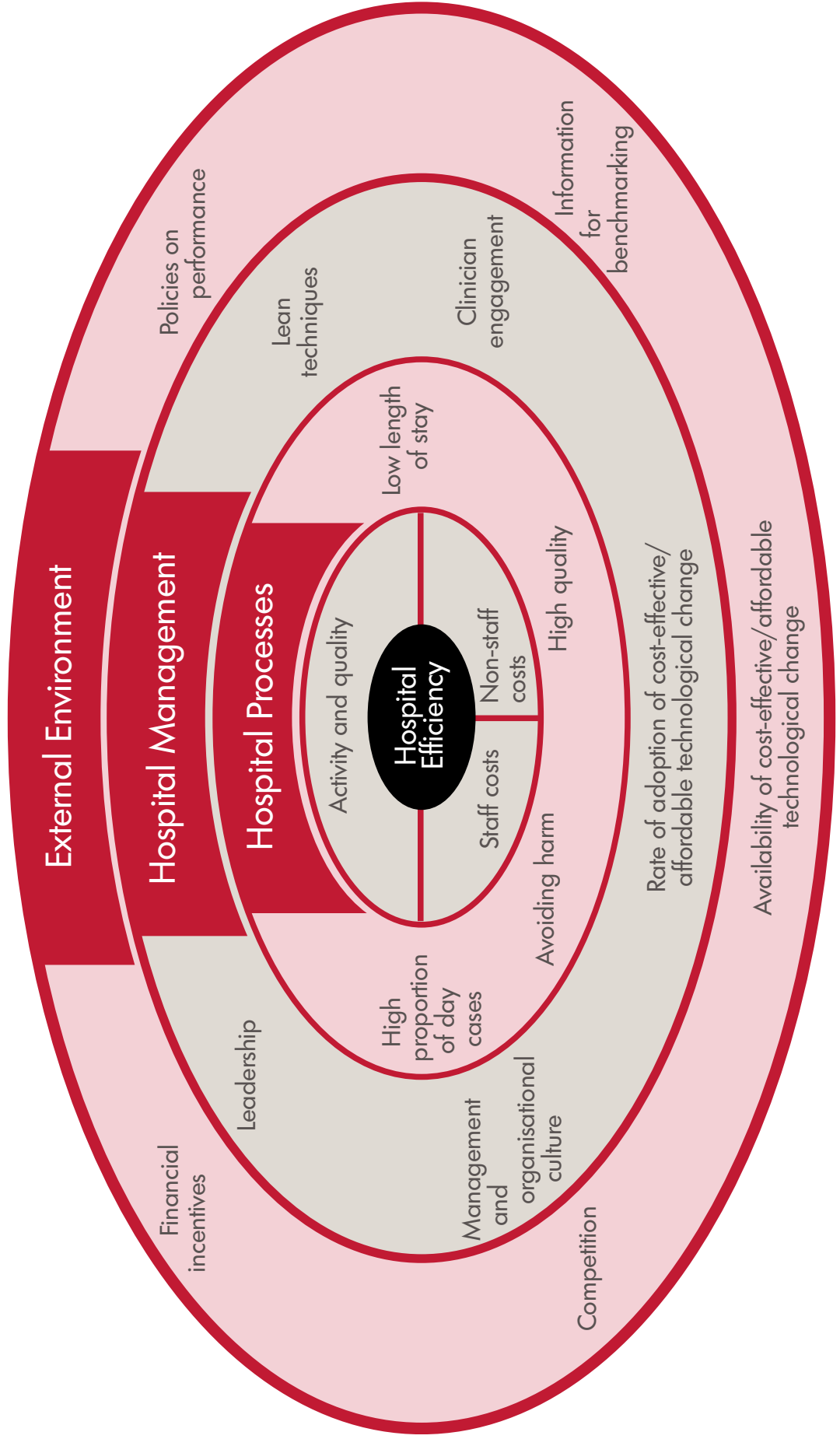
- financial incentives
- information for benchmarking performance
- the availability of cost-effective technological change.

The following five chapters in this report contain an examination of the determinants of hospital efficiency following Figure 2.1 ring-by-ring inwards, starting with the external environment in Chapter 3. Chapters 4 and 5 are devoted to management issues and to technology diffusion, respectively. Chapters 6 and 7 are devoted to hospital processes (excluding staff) and staff productivity, respectively.

### Key points

- Both literature review and fieldwork have encountered well-known difficulties with the measurement of efficiency. Much of the measurement of efficiency is crude: that is, it excludes quality (outcomes).
- Estimates of hospital inefficiency using a benchmarking (or 'frontier') approach find average levels between 10 per cent and 20 per cent in many countries, including the UK.
- Estimated HCHS efficiency rose by about 20 per cent in crude terms between 1974 and 1999 in England. Quality-adjusted HCHS efficiency fell at an average rate of -1.4 per cent a year between 1995 and 2008 – most of the decline was during the period of rapid expansion of the NHS after 2001.
- The determinants of hospital efficiency are many, and can be sought both within hospitals and in their external environment.

Figure 2.1: Determinants of productive efficiency in hospitals



## 3. The external environment

This chapter addresses certain *external* determinants of efficiency within hospitals, such as:

- financial pressure
- technological change
- the degree of competition
- payment methods
- external performance management.

Whereas the evidence is clear that some of these factors are associated with higher hospital productivity, the evidence on others is more mixed. As mentioned previously, this report does not look systematically at whether investment or disinvestment elsewhere in the health system would affect efficiency within hospitals. It notes simply that current health policy in Britain already favours shifting some care from hospital to settings closer to home.

### Financial pressure

One of the most striking and consistent findings of the literature on hospital productivity is that external financial pressure is associated with improvements in hospital productivity. The term ‘financial pressure’ can include one or more of the following: reductions in global budgets or revenues; a squeeze on prices or payment rates for services provided; and a rise in input prices not compensated for elsewhere. One or more of these factors may show up as a change in the surpluses or deficits of hospitals if no compensating actions are taken.

Appleby (1999) has examined a long time series of real spending on the NHS (mainly covering a period when hospitals were financed by global budgets), and a crude measure of hospital productivity: discharges and deaths per pound of real spending in hospitals. His investigation reveals a linear, inverse relationship between annual changes in real spending and annual changes in crude productivity in the HCHS between 1951 and 1991. The volume of inpatient activity has increased reliably between 1 per cent and 5 per cent in most years, irrespective of the rate of growth of resources. This means that crude productivity has tended to fall when resources have grown rapidly – as they did from 2000 to 2010 – and has tended to rise when resources have grown slowly or have fallen in real terms. Unfortunately, Appleby was unable to measure the impact, if any, of this association on the quality of care.

Appleby (2008) has described a similar relationship across England and Scotland. Scotland has been budgeted to spend about 18 per cent more per capita on health services than England in recent years. Yet, a number of very crude measures of hospital productivity including admissions + day cases per bed, admissions + day cases per nurse and operations per consultant suggest that productivity in Scotland has been

between 61 per cent and 89 per cent below that in England. The Nuffield Trust has published work recently which extends these performance comparisons in a number of ways, confirms the crude productivity differences between England and Scotland and suggests that one measure of quality – surgical waiting time – is shorter in England (Connolly and others, 2010). Of course, other factors may be at work in explaining these differences between Scotland and England, such as different approaches to the internal market and NHS performance management (Propper and others, 2007).

Financial pressure seems to have similar effects on hospital efficiency in the US, although the measures of financial pressure which have been used vary across studies. Hadley and others (1996) examined the effect of hospital profitability and competition on various measures of performance in 1,435 acute hospitals in the US between 1987 and 1989. Efficiency was defined as the percentage difference between a hospital's actual costs and its minimum expected costs, as identified by a frontier analysis. There was no control for quality. Over the period of observation, the least profitable hospitals constrained their growth in expenses to half that of the most profitable hospitals by limiting the growth of staff and assets. Efficiency increased by 1.8 percentage points between 1987 and 1989 (11.2 per cent of the initial level of 16.1 per cent in 1987) in the least profitable hospitals. Inefficiency increased slightly in the most profitable hospitals. Hospitals in more competitive areas controlled expenses in relation to those in less competitive areas. There was no evidence of successful cost-shifting.

A fairly recent American event with obvious relevance to the situation facing the NHS in 2010 was the Balanced Budget Act of 1997. This was a federal law which reduced payments to hospitals under Medicare mainly by restricting inflation-updating of DRG payment rates over a number of years. Bazzoli and others (2004–05) looked at the consequences of this tariff squeeze for US hospital operations, although they did not investigate hospital efficiency as such. They found that the hospitals under the greatest financial pressure tended to increase both inpatient and outpatient Medicare volumes – especially the latter – and to maintain staffing and bed levels following the Act. This is suggestive of efficiency improvements achieved by raising the volume of activity, rather than by cost-cutting. In other words, under a case-based payment regime, total cost may not fall following a tariff squeeze if the volume of activity is allowed to rise.

Rosko (2004) has confirmed, using frontier analysis, that there were gains in relative cost-efficiency for teaching hospitals in the US following the Act. He examined the impact of environmental factors on the efficiency of 616 US teaching hospitals in the period 1990–99. He found an improvement in average relative cost-efficiency of about 6 per cent following implementation of the Act.

In an earlier period, Mark and others (1998) published a study which links financial pressure with both management behaviour and performance in US hospitals. This study examined the effect of financial pressure on nine varieties of hospital/doctor financial engagement in 1,485 US hospitals in 1991–93. The study found that hospitals experiencing financial pressure, in the form of smaller margins and higher costs, were more likely to have implemented strategies to integrate doctors in financial management and to modify clinical behaviour. The number of strategies implemented was associated positively with the hospitals' subsequent financial performance.

There is a lack of studies which have examined the impact of spending reductions on quality of care over time. The question of possible efficiency/quality trade-offs within countries is revisited later in this report.

## Technological change

Technological change has been the major determinant of improvements in productive efficiency in health care over the medium and longer term. For example, Cutler and Berndt (2001) have shown that if output is measured as outcomes, technical advance has raised outcomes and reduced the cost of health gain per episode for many conditions, such as acute-phase depression, heart attacks and cataracts, in recent decades.

Similarly, a number of frontier studies have suggested that technological change has been the major determinant of efficiency changes in hospitals over time. Such studies have decomposed the determinants of efficiency changes into economies of scale, pure technical efficiency and technological change (see Appendix C). For example, Maniadakis and others (1999) examined productivity trends in a sample of 75 Scottish hospitals between 1991/92 and 1995/96 – a period immediately following the introduction of internal market reforms into the NHS in 1991. Their study is distinguished by the use of a quality variable in the measurement of output: 30-day survival following strokes, heart attacks and fractured neck or femur. The results suggest that over the four years following the internal market reforms, average quality-adjusted productivity increased by about 2.5 per cent. There was virtually no change in either pure technical efficiency or scale efficiency over the four-year period. Rather, technological change was the main determinant of productivity improvement: a finding which echoes a number of other papers cited in the same article. Similarly, Hollingsworth and Parkin (2003) found that technological change dominated change in pure technical efficiency among acute hospitals in one region in England between 1994/95 and 1995/96.

Linna (1998) investigated changes in the efficiency of 43 Finnish hospitals between 1988 and 1994 using frontier techniques. He was not able to allow for quality. His results suggest that crude efficiency in these hospitals increased by between 3 per cent and 5 per cent a year over six years. Half of the improvement was due to increased cost-efficiency and half was due to technological change.

However, whereas individual technological advances are often *more productive* than the least cost-effective technologies currently in use, and therefore have the potential to raise overall productivity, it is often difficult to reap *net cost savings* from them, especially when they are at their newest. That is because many such advances – such as renal dialysis and coronary artery bypass graft – offer addition, not substitution. The new therapies offer care for hitherto untreatable, or partially untreatable, conditions, generating new demand for treatments and putting upward pressure on expenditure.<sup>2</sup> In addition, new technologies are often introduced at premium prices. Moreover, some new interventions – especially preventive interventions – offer net savings, but only in the long term. Hence, although new, more cost-effective technologies become available, their adoption often poses funding problems, especially when budgets are static or falling.

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<sup>2</sup> Official estimates in the US suggest that about half of the historical increase in real health spending has been driven by technological change (Center for Medicare and Medicaid Services, 2000).

Relatively few medical advances offer cheaper substitutes for existing therapies, although examples do exist, such as the discovery that peptic ulcers can be generally cured by a course of antibiotics, replacing expensive treatments such as long-term palliative drug therapies or surgery. Also, a Dutch study of the impact of 63 broad innovations on costs in 66 general hospitals between 1995 and 2002 found one (but only one) group of technologies for which the impact on costs was both negative and statistically significant: the adoption of information and communication technology for various hospital processes (Blank and Van Hulst, 2009).

It is generally difficult to recycle resources between old and new technologies quickly, especially if budgets are static or falling and the technologies involve different patient groups (raising questions about allocative efficiency) and fixed or dedicated resources (Adang and others, 2005). However, even when budgets are static or falling, it may be possible to fund, out of savings made elsewhere, some new technologies which would add to total costs. This appears to be part of the logic behind the intention to reinvest the proceeds of some of the cost-saving, hospital productivity improvements required under successive operating frameworks for the NHS in England recently (for example, Department of Health, 2009a; 2010f). However, not all of these savings are likely to be recycled into hospitals.

The National Institute for Health and Clinical Excellence (NICE) already publishes evidence relating not only to the cost-effectiveness of new technologies, but also to the likely national cost of adopting those that are approved. In addition, it publishes costing templates to assist local decision-makers in assessing the likely impact on their budgets of implementing new advances. Furthermore, NICE has published a list of 19 new technologies which have been found to be cost-reducing; NICE reckons that if all of these were implemented nationally, it would save several hundred million pounds in the NHS (National Institute for Health and Clinical Excellence, 2010). Questions about technology adoption and management are revisited below.



Although new, more cost-effective technologies become available, their adoption often poses funding problems, especially when budgets are static or falling

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## Competition

A number of frontier studies in the US have reported that the degree of competition between hospitals has a favourable effect on their efficiency. Studies which lack quality measurement include Rosko (2001). Those that include quality measurement include Jiang and others (2006a; 2006b), Huerta and others (2008) and Valdmanis and others (2008).

This project has not identified any UK studies which have used frontier techniques as such to examine the effect of hospital competition on efficiency. However, a review by Propper and Soderlund (1998) of a number of UK price and cost studies suggests that the introduction of price competition between NHS hospitals, following the introduction of what might be termed 'the first internal market' into the NHS in 1991, had some downward effect on prices and, after a delay, costs. One study reported



that costs had been reduced by 14 per cent by 1994/95 in the 25 per cent of hospitals in the most competitive markets.

Subsequent statistical work by Propper and others (2008) suggested that price competition in 'the first internal market' had an adverse effect on acute myocardial infarction mortality, but a favourable effect on waiting times among acute hospitals in England between 1991 and 1999. The authors of this study infer that price competition led to an improvement in observable quality (waiting times) at the expense of unobservable quality (mortality). They also argue that the value of the mortality deterioration probably outweighed the value of the waiting time improvements and therefore that overall efficiency probably fell.

However, more recent work on hospital behaviour in what might be termed 'the second internal market', which was introduced to the NHS in 2004 and which involves non-price competition and increased patient choice, suggests that the introduction of this new form of competition reduced both acute myocardial infarction mortality and length of stay, leaving costs unchanged and implying a possible increase in efficiency (Cooper and others, 2010; Gaynor and others, 2010). It seems that the different modes of competition may affect hospital behaviour in different ways.

## Payment methods

Payment methods and their reforms can affect hospital efficiency under some circumstances. Many countries, including England, have introduced national, fixed-price, case-based payment systems using diagnosis-related groups (DRGs) or health care resource groups (HRGs) in recent decades. These have variously replaced prospective global budgets (in England and many other European countries) or retrospective cost-based payment systems (in the US). Fixed-price, case-based payments encourage efficiency by:

- rewarding hospitals for the activity chosen by purchasers or patients
- rewarding hospitals for cost-reduction
- informing purchasers about relative prices
- encouraging competition on quality rather than price.

In addition, such systems of administered prices can be managed centrally by the price-setting authorities to extract 'efficiency' savings from hospitals, encourage changes in case mix or incentivise quality improvements. There may be less desirable side-effects from such systems, such as increasing transaction costs, encouraging 'cream skimming' (that is, discrimination against sicker patients) and encouraging hospitals to classify patients in higher DRG/HRG categories than is justified. It is often said that case-based payments encourage increases in activity, but this rather depends on what the relationship is between the fixed price and costs in a particular hospital (Mannion and others, 2008).


The introduction of the DRG-based, per-case payment system for Medicare inpatients (the Prospective Payment System) in the US in 1983, which replaced cost reimbursement, initially reduced cost per admission and length of stay. It also led to a reduction in admissions and an increase in outpatients, which were outside the payment system. Measures of quality, such as mortality rates, did not seem to



deteriorate and technology adoption did not appear to have been impeded (Coulam and Gaumer, 1991). A number of subsequent US studies found that hospital efficiency – measured by frontier methods – was positively related to hospitals' dependence on Medicare (and Medicaid) patients (Rosko, 2001).

In Sweden, using frontier methods, Gerdtham and others (1999) reported that the replacement of global budget payments by an internal market, combined with case-based payments for hospital inpatients, led to an increase in technical efficiency between 1989 and 1995. They estimated that the potential saving in costs from replacing budget-based allocations with internal markets and case-based payments was nearly 10 per cent. In Norway, again using frontier methods, Biorn and others (2002) found that the introduction of case-based funding for hospitals also led to an increase in technical efficiency. However, there was deterioration in cost-efficiency following the reforms, probably because overall budgets expanded, activity increased and there was a rise in relative remuneration rates for scarce doctors and nurses. This suggests that the effect of introducing case-based payments on efficiency will depend partly upon whether such changes are accompanied by expanding or contracting budgets and activity.

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Fixed-price, case-based payments for acute inpatients were not introduced on a significant scale into NHS acute hospitals until 2004 under Payment by Results. This was during a time of significant budgetary expansion in the NHS. They replaced block contracting that contained, implicitly, prices for DRG activity which varied across hospitals. There was a remarkable and sustained rise in the rate of increase of day cases in England from 2004 to 2009, following the introduction of Payment by Results. There was also a considerable rise in emergency admissions (National Audit Office, 2010). Farrar and others (2007) reported that length of stay had fallen and day surgery had risen faster in England than in Scotland (which had not introduced Payment by Results) between 2003/04 and 2004/05. Moreover, activity had risen and hospital mortality (for foundation trusts only) had fallen faster in England than in Scotland over the same period. Despite this, Sussex and Farrar (2009) reported that a sample of senior NHS managers had not detected any Payment by Results impact over and above other efficiency initiatives, or any impact, positive or negative, on quality of care up to 2008. The National Audit Office has identified delays in rolling out Payment by Results to all hospital activity in England: by 2010 only about 60% of such activity was covered.

In the interests of encouraging efficiency along the patient pathway, there has been experimentation with episode-based payment systems in England and the US involving bundling some hospital and non-hospital services together under one payment for a patient with a given condition. However, the technical difficulties in applying such methods on any scale seem to be formidable (Mechanic and Altman, 2009; Robinson and others, 2009). Furthermore, there has been much interest in rewarding quality (or ‘paying for performance’; this is dealt with in ‘Pay-for-performance and Commissioning for Quality and Innovation’ below).

## External performance measurement and management

There has been much investment in variously measuring, benchmarking, publicly reporting, targeting and rewarding the performance of health care providers in recent decades, especially in relation to quality of care. Arguably, it is self-evident that measuring performance must be a necessary condition for managing performance. There is some evidence that performance measurement for internal management purposes is associated with higher productivity (see ‘Management and organisational culture’ in Chapter 4). However, the evidence is much more mixed on external reporting of and/or incentivisation of performance. (Non-financial interventions are covered in this section. Financial interventions or ‘pay-for-performance’ are covered in the next section.)


In their review of the effect of incentive mechanisms on providers’ behaviour, Custers and others (2008) concluded that the evidence was mixed on the effect of public reporting of quality on behaviour. However, one well-designed project in Wisconsin, involving the publication of selected quality indicators for 24 hospitals (with 98 controls), concluded that hospitals with public reporting had engaged in more quality improvement activities and were more likely to have improved outcomes than the controls (Hibbard and others, 2003; 2005). The authors argued that the hospitals concerned were motivated more by concern for their reputation than by patient choice, because in Wisconsin doctors were tied to hospitals and patients were reluctant to change their doctor.

Fung and others (2008) reviewed the evidence on whether publishing patient care performance data in the US improves quality of health care: 45 peer-reviewed articles were examined, which assessed the effect of public release of performance data on the selection of providers, quality improvement activity and outcomes. The authors found inconsistent associations between public reporting and provider selection. Of the hospital studies, 11 showed stimulation of quality improvement activities, but the evidence on the impacts on effectiveness was inconsistent. There was little evidence concerning patient safety or patient-centredness.

In England, there has been an emphasis on performance measurement and management in the NHS since the Griffiths reforms in 1983. There was measurement and explicit targeting of crude efficiency improvements in the HCHS by the Department of Health from the early 1990s (Smee, 2005). Targets were made more ambitious and applied to NHS regions from 1991–92. This was followed by a sharp rise in crude HCHS efficiency over the following three years, as mentioned previously. However, productivity then faltered and concern grew that the volume of activity was being driven up at the expense of quality.

In relation to a later period, Bevan and Hood (2006) reviewed the effect of the publication of performance ratings together with targeting some selected indicators of quality for NHS trusts in England between 2001 and 2005. They concluded that the then ‘star rating’ system had improved performance on key targets such as waiting times. However, the effect on services excluded from the star ratings and, therefore, the effect on overall efficiency, was unclear. In some cases, data had been manipulated to achieve key targets, and there was some evidence of gaming and unwanted effects elsewhere. Mannion and others (2005a) interviewed senior managers in a sample of high- and low-performing acute hospital trusts, and reported that the star ratings were not generally viewed as a ‘balanced scorecard’. Although the system was useful for motivating staff, there were many dysfunctional side-effects. In addition, Custers and others (2008) have pointed to the risks of unintended consequences from incentive systems, including gaming by providers and the transfer of effort from unobserved to observed activity. Many of the difficulties arise from incomplete measurement of performance – which is unavoidable, given the current limitations on measuring quality of care.

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 Few senior managers viewed the additional autonomy on offer to foundation trusts as a particularly valuable prize; consequently the incentives for improved performance were weak

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One way of rewarding the good performance of hospitals non-financially is through ‘earned autonomy’. In the UK, well-managed hospitals have been eligible to be granted greater independence as foundation trusts for some years. However, on the basis of a survey of NHS managers in England, Mannion and others (2005c) reported that few senior managers viewed the additional autonomy on offer to foundation trusts as a particularly valuable prize, and that consequently the incentives for improved performance were weak. In their review of the literature, Custers and others (2008) could find no evidence that earned autonomy in hospitals leads to performance improvement.

### Pay-for-performance and Commissioning for Quality and Innovation

A criticism of standard systems of case-based payment is that they do not reward improvements in quality of care. Many countries, including England, are now developing ways to incentivise quality improvement through more sophisticated, ‘pay-for-performance’ versions of case-based payment, or through other rewards and penalties. There are many different varieties of so-called ‘pay-for-performance’ scheme depending on:

- whether they are based inside or outside hospitals
- which activities or outcomes are rewarded or penalised
- the size of the rewards and penalties

- whether the rewards and penalties are, respectively, for:
  - adhering to guidelines
  - relatively high or low performance
  - improvements or deterioration in performance
  - performance exceeding or falling below certain benchmarks.

A relatively early review of the pay-for-performance literature in health care and related fields in the US found that the empirical foundations for such strategies were rather weak, in both health care and non-health settings. However, the weakness of the health evidence could be attributed to the small size of the financial incentives that had been deployed up to that time (Rosenthal and Frank, 2006).

A later US review (Mehrotra and others, 2009) was based on a larger body of evidence and a handful of more rigorous evaluations. In particular, three evaluations of HQID (the Centers for Medicare and Medicaid Services' Premier Hospital Quality Incentive Demonstration Project) were identified, which compared performance in HQID hospitals with control hospitals that had adopted public reporting only. The HQID offers financial rewards for good-quality care assessed by 33 process and outcome indicators of quality for five clinical conditions. Hospitals performing in the top decile of performance receive a bonus of 2 per cent over the usual Medicare reimbursement rate, and hospitals in the second decile receive a 1 per cent bonus. There is provision for financial penalties for poorly performing hospitals that have failed to improve after three years. The three evaluations suggested that this scheme generated a modest 2–4 percentage-point improvement in process quality in the intervention hospitals, compared with the controls, between 2003 and 2006. The control hospitals themselves demonstrated significant quality improvement over the period – perhaps because they were all involved in internal management (and public reporting) of quality.

No information is given in Mehrotra and others (2009) on whether the benefits of the scheme exceeded its costs. However, a study by Ryan (2009) of more than 11 million individual Medicare patient records in 3,570 acute hospitals from 2000 to 2006, has shed more light on the question of cost-effectiveness. Ryan reports finding no evidence that the HQID had any significant effect either on risk-adjusted 30-day mortality, or on 60-day cost for acute myocardial infarction, heart failure, pneumonia or coronary artery bypass graft patients. On the basis of this study, the HQID seems to have had little, if any, effect on hospital efficiency in the US.

A pay-for-performance scheme similar to the HQID was introduced into 24 acute hospital trusts in north-west England in 2008. Trust performance was assessed by a score based on mortality and re-admission rates (variously) in five clinical domains. In the first year, trusts in the first quartile of performance were rewarded with a bonus equalling 4 per cent of the revenue that they had received under the national tariff – which went to the clinical areas concerned. The trusts in the second quartile received a bonus of 2 per cent of revenue. In addition to paying bonuses, there was investment in engaging clinicians, learning among clinicians, setting up monitoring systems and public reporting. A preliminary evaluation of two years of this scheme using individual patient data suggests that mortality was reduced significantly in two of the five clinical domains: heart failure and pneumonia. However, it is not clear whether these favourable results were due to the payment of bonuses or to the spotlight shone on clinical performance and quality, or both. Preliminary analysis suggests that if only the cost of bonuses is considered, the scheme was cost-effective (Sutton and others, 2011).

Since 2009, a rather different approach to pay-for-performance for hospitals and other secondary providers has been adopted in England as a whole. Following the vision set out in *High Quality Care for All* (Department of Health, 2008), the Commissioning for Quality and Innovation framework makes a proportion of the provider's income (1.5 per cent in 2010/11) conditional on quality and innovation. The scheme is designed to accommodate local targets for improvements, negotiated between primary care trusts (PCTs) and providers. However, acute hospital schemes also must include two national targets for improvement, one of which involves improving responsiveness to the personal needs of patients, using data from the national survey of patient experience. An independent evaluation of the scheme was launched in 2009 with a view to reporting in 2012. At the time of writing it is not clear to what extent this new scheme will achieve its aims or enhance efficiency.

### Key points

- Longitudinal and cross-sectional evidence, from both the UK and the US, suggests that external financial pressure on hospitals is associated with improvements in crude productivity. However, little or nothing is known about the effects of such pressure on quality.
- A number of studies have suggested that technological change has been the main determinant of improvements in quality-adjusted hospital productivity over time. However, it is often difficult to find cost savings from the newest medical advances.
- Several US studies, some including measurement of quality, suggest that competition between hospitals stimulates efficiency. Recent British work on non-price competition between hospitals suggests that it may lower both length of stay and mortality, leaving costs unchanged.
- Studies in a number of countries suggest that when case-based payments replace global budgets or retrospective cost reimbursement for hospitals, there are improvements in efficiency or a number of indicators potentially associated with efficiency, such as length of stay and cost per admission. However, total costs may increase if budgets and activity are allowed to rise at the same time.
- The evidence appears to be mixed both on the effects of public reporting of performance data on performance, and on the effects of setting external targets for performance and productivity.
- The evidence is also mixed on the effects of Medicare's pay-for-performance experiment (HQID) on quality of care in the US. The preliminary results from a similar scheme in England are more favourable. It is too early to assess the results from England's rather different hospital pay-for-performance scheme (Commissioning for Quality and Innovation).

## 4. Leadership, management and staff engagement

This chapter addresses the set of determinants of hospital efficiency that concern leadership, the management and culture of hospitals and staff engagement. It suggests that such factors play a critical part in improving hospital outcomes and productivity.

### Leadership

There is a widespread belief – if not a universal conviction – that good leadership is an essential ingredient for organisations to perform well.

It is all too easy to find health literature on the topic of leadership. A search of PubMed early in 2010 revealed more than 28,000 references containing the keyword ‘leadership’, but only 49 references using the three keywords ‘evidence’, ‘leadership’ and ‘efficiency’. Most of the 49 references proved to be of little or no relevance to this enquiry. In particular, only a few references were found which contained statistical evidence to support (or reject) hypotheses about leadership and hospital efficiency: presumably in part because it is difficult to define and measure leadership. What follows concentrates on a few such references.

In view of the positive association often found between quality and efficiency (see ‘Getting care right first time’ in Chapter 6), it is significant that there is statistical evidence from the US that suggests that leadership at hospital board level is important in achieving high-quality hospital care. Jiang and others (2009) found that in 490 hospitals where board presidents had responded to a survey on board supervision of quality, certain board practices were positively associated with both process and outcome measures of quality for three major conditions. The board practices included:

- having a board quality committee
- establishing strategic goals for quality improvement
- being involved in setting the quality agenda for the hospital
- including a specific item on quality in board meetings
- using a ‘dashboard’ with national benchmarks that included indicators for clinical quality, patient safety and patient satisfaction
- linking senior executives’ performance evaluation to quality and patient safety indicators.

Involvement of doctors in leadership in the board quality committee further enhanced the hospital’s quality performance. Unfortunately, this study did not investigate costs.



Leadership was investigated as one characteristic in a study by Mannion and others (2005b) of the cultural characteristics of ‘high-’ and ‘low-’ performing hospitals in the NHS. The study was based on interviews with middle managers in a sample of six hospital trusts: two of which had been awarded three stars (the maximum), and four of which had been awarded one or no star, under the then star-rating system for NHS hospital performance. Here, it is assumed that star ratings were linked to efficiency, if only weakly. Among the cultural differences that were detected in the two groups of hospitals were differences in leadership characteristics and style. The chief executives in the high-performing hospitals were assessed (following a classification by Handy, 1988) as having ‘Apollo-like’ characteristics, which included adherence to rules and procedures and belief in formal communications and established systems. Their style of leadership was assessed as ‘transactional’. The chief executives in the poorly performing hospitals were assessed as having ‘Zeus-like’ characteristics, which included being prone to personal and capricious interventions and fostering a culture of patronage. Their style of leadership was assessed as ‘charismatic’.

Case studies have concluded often that good leadership is an essential ingredient in achieving improvement in the performance of health organisations. For example, the dramatic turnaround that was achieved in the apparent efficiency of the Veterans’ Health Administration (VHA) in the US in the mid-1990s is widely attributed to the leadership of the Under-Secretary for Health at the VHA from 1994 to 1999, Kenneth Kizer (Oliver, 2007).



Case studies have concluded often that good leadership is an essential ingredient in achieving improvement in the performance of health organisations

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## Management and organisational culture

Management behaviour and organisational culture are widely believed to influence productivity. In the private sector, extraordinary differences are found in productive efficiency between firms and plants within countries. There are also significant differences between countries, with US firms tending to demonstrate higher productivity than European firms on average (Bloom and Van Reenen, 2006). Econometric studies suggest that many of the differences can be explained by variations in the rate of technology diffusion across firms and countries (a topic discussed in the context of hospitals in the next chapter). However, residual differences remain which have been attributed, at least partly, to good and bad management practices. Bloom and Van Reenen (2006) collected information on 18 management practices from 732 medium-sized firms in France, Germany, the UK and the US, and found that they were strongly associated with firm productivity, profitability and survival rates. US firms appeared to be better managed than European firms. The management practices can be grouped into four areas:

- 1 Operations – such as Lean manufacturing techniques.
2. Monitoring – measuring the performance of members of staff, reviewing the results and managing the consequences.

3. Targets for staff – including their realism and transparency.
4. Incentives – including promotion criteria, pay and dealing with poor performance.

Management practices varied greatly across firms, and good management was associated with the degree of competition in product markets. In a separate study, the authors found that good management practices were associated positively and strongly with pro-worker practices and better work–life indicators for staff, leading the authors to speculate that workers will prefer to work in well-managed firms (quoted in Bloom and Van Reenen, 2006).

Similar results have been published recently for the NHS. Bloom and others (2010) interviewed managers and clinicians in orthopaedics and cardiology in acute hospitals in England using an evaluation tool that defines and scores 18 different management practices. Here, the management practices fell into four groups:

1. Configuring and improving patient pathways
2. Setting targets
3. Measuring performance and staff management
4. Using rewards and sanctions to foster talent and good performance.

Bloom and colleagues found that their measure of management quality was correlated favourably with indicators of hospital performance such as mortality rates, waiting times, financial performance, staff satisfaction and the overall rating from the Healthcare Commission, although the authors warn that this may not imply causal relationships. As with private firms, the researchers found evidence of great variation in management practices across hospitals, with NHS hospitals doing less well than private, commercial firms on average, especially in the area of people management. Management appears to be better in hospitals where senior management has some clinical training. Also, management appears to be better in hospitals that face more competition.

In the study mentioned previously, Mannion and others (2005b) compared a series of management characteristics across their six high- and low-performing hospital trusts (differentiated by star ratings) on the basis of their interviews with middle managers, and found a number of differences. In the high-performing trusts the management orientation was corporate, middle management was strong and empowered, accountability was clear, rewards were performance-related, information systems were highly developed and the taboo was not hitting targets. By contrast, in the poorly performing hospitals, management orientation was pro-professional, middle management was underdeveloped and emasculated, accountability was opaque, rewards were patronage-related, information systems were underdeveloped and the taboo was challenging senior management.

In the US, Vina and others (2009) investigated the association between various organisational factors and quality of care among 92 Hospital Quality Incentive Demonstration (HQID) hospitals that had implemented pay-for-performance. They compared quality scores between hospitals in the top two and bottom two deciles of performance. More top-performing hospitals reported having:



- adequate human resources for quality improvement
- support of the nursing staff
- an organisational culture that supported coordination of care, pace of change, willingness to try new projects and a focus on identifying system errors rather than blaming individuals
- more use of clinical pathways
- organisation into multidisciplinary teams
- use of computerised doctor-order entry<sup>3</sup> into the hospital.

#### Box 4.1: Leadership and management teams

Change to the top team was a feature of almost all of the (previously failing) six trusts visited as part of the fieldwork for this report. The chief executives emphasised that organisational change could not have happened without replacing most of the executive team, to ensure that people with the right skill set were driving productivity.

Obviously there are downsides to drastic management change: new management teams can take a long time to bed in and build the right relationships, and senior managers at St Helens & Knowsley Teaching Hospitals NHS Trust told of the effort involved in trying to overcome a climate of fear left by the rapid removal of a large number of managers. Michael Magee, Partner at PricewaterhouseCoopers, argues that organisations would be better to augment the organisation's ability to deliver change. He says, "It's about getting people's heads up, because heads go down very quickly when organisations come under pressure".

One of the biggest challenges going forward, according to Antony Sumara, former Chief Executive of Mid Staffordshire NHS Foundation Trust and one of the experts we consulted, is capacity and capability issues for health service leaders "who have managed the NHS during ten years of massive growth and done, at best, an average job". He argues that instead of getting rid of people who do not have the capability to handle the coming challenges, greater creativity is needed to help individuals through that period. He is attracted to the idea of a pool of senior leaders who can work flexibly and at short notice to help NHS organisations on specific issues. It will mean changing the mindset around securing management expertise and learning to value 'transitional people' who do a job for a short time and then move on. "In the NHS, we appoint a new chief executive and expect that to sort it out," he says.

The present research revealed a tendency for trusts to adopt a 'command and control' approach when trying to turn around finances. At the six study sites, cost improvement programmes were tightly managed and chief executives tended to focus their attentions in-house and suspend any activity outside the trust until recovery had been achieved. Only then would executive leaders pursue a more transformational, engaging style of leadership, characterised by devolution of responsibility for budgets and clear lines of accountability. NHS managers agreed that this type of approach is more likely than a centralised one to support the NHS through the funding squeeze.

3 The electronic entry of doctors' instructions for the treatment of patients.

In the UK, West and Patterson (1999) have reported, for manufacturing companies, positive associations between certain aspects of management culture (such as an emphasis on the welfare and development of employees and a sharp focus on goals, objectives and performance) and firms' profitability and productivity. They have reported also that certain human resource management practices are linked with firms' productivity. In addition, West and others (2002) have linked certain human resource management practices in NHS acute hospitals in England (such as the extensiveness of staff appraisal, sophistication of staff training and percentage of staff working in teams) favourably to patient mortality after controlling for certain other variables. More recently, the National Audit Office (2010) has reported that not all NHS staff receive an annual appraisal or related performance development review, although the proportion increased from 61 per cent to 69 per cent between 2007 and 2009.

### Clinician engagement

One of the most challenging aspects of hospital management is that many hospital workers, especially doctors, enjoy (appropriately) a high degree of professional autonomy. This is particularly true in the US, where most doctors who treat patients in hospital settings are not hospital employees but have so-called admitting privileges. In the UK, NHS hospital doctors are hospital employees but still enjoy clinical freedom. The Griffiths reforms of 1983 introduced general managers into NHS hospitals, with a view to putting someone 'in charge' of hospitals. Subsequently, in many hospitals clinical directors were appointed to lead the management of services in particular clinical areas. However, when Harrison and others (1989) reviewed doctor–manager relationships six years later, they found little change in relations. General managers appeared to continue to inhabit a shared culture of medical autonomy and rarely challenged clinicians. Writing on the more specific issue of the reform of the governance of medical performance, following the Bristol Royal Infirmary Inquiry and the attempt to promulgate a management-led system of clinical governance in 1999, Salter (2007) has described the subsequent development of rival policy streams between state and profession, and identified little engagement between them and an unresolved competition for policy dominance.

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“ It is not surprising that there is a significant literature that associates hospital productivity with the degree of cooperation and engagement between general managers and doctors

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In view of this, it is not surprising that there is a significant literature that associates hospital productivity with the degree of cooperation and engagement between general managers and doctors. In the US, Goes and Zhan (1995) analysed data on hospital performance and hospital–doctor integration strategies in about 300 acute hospitals in California over the period 1981–90. Greater financial integration between hospitals and doctors was related to lower hospital operating costs, especially after the implementation of the Prospective Payment System. As previously noted, Mark and others (1998) analysed survey data in the US on hospital–doctor relations in 1,485 hospitals, together with data on hospital costs and profits over the period

1991–93. The number of integration strategies implemented was positively associated with financial performance. Mark and colleagues also found that making departmental heads responsible for departmental profit and loss had a significant positive effect on margins, whereas including medical staff on hospital boards had a significant negative effect on average Medicare costs.

In a recent review of the US literature on hospital–doctor collaboration, Burns and Muller (2008) report a 1992 study by Lewin-ICF, which compared pairs of hospitals that made and lost money under the Medicare programme. A key distinguishing feature was the level of both hospitals’ and doctors’ behavioural skills. These skills included:

- doctors’ trust in hospital executives
- mutual respect and support
- frequent and candid communication
- doctors’ involvement in all clinically related decision-making
- transparency of hospital finances to doctors
- consistent doctor and hospital executive leadership over time
- doctors’ leadership development
- doctor-led efforts to promote a sense of shared economic risk (Burns and Muller, 2008).

Other studies cited by Burns and Muller had reached similar conclusions. In addition, a number of US studies had suggested that employment of doctors by hospitals – the model already used by the NHS – enhances some of these behavioural skills. In addition, there is literature which suggests that the growing practice of employing ‘hospitalists’ (general doctors) in US hospitals to relieve (non-hospital) admitting doctors of some of their clinical responsibilities for emergency and inpatient care is improving the management of patients and associated with shorter length of stay and reduced utilisation, without cutting quality of care (Burns and Muller, 2008). As noted previously, Jiang and others (2009) found that senior clinical involvement in board quality committees enhanced quality performance in a sample of US hospitals. Finally, in their review of the topic of ‘engaging doctors in leadership’, Ham and Dickinson (2008) concluded, among other things, that whereas productive change in NHS hospitals appears to benefit from the combination of a committed chief executive working on shared goals with medical champions, progress in achieving such combinations is very uneven both within and across NHS hospitals.

### Box 4.2: Service-line reporting

Service-line reporting allows trusts to monitor income and expenditure – and therefore surpluses and deficits – in each clinical department of the hospital, and to involve the relevant staff in allocating resources. This allows clinicians to be ‘put at the heart of historically contentious debates on resources versus clinical need’ (Fleming, 2007: p17), albeit at some cost in terms of data collection and management and clinician time. It also allows departments to be rewarded for improving financial surpluses by allowing, for example, some or all of any surpluses to be retained in the department which has generated them. Monitor, which currently regulates NHS foundation trusts and is set to become the economic regulator of the NHS, has reviewed some early experience with using service-line reporting in England and investigated its use in Germany, Norway and the US (Monitor, 2007). It found that service-line reporting ‘has provided a basis for greatly improved strategic planning and has introduced greater levels of efficiency into health care systems and has led to an overall improvement in the general quality of care and patient experience’ (Monitor, 2006).

Service-line reporting was considered by the NHS executives the authors met with to be the most powerful tool for engaging clinicians in securing efficiency improvements. Donal O’Donoghue, Medical Director at Sandwell and West Birmingham Hospitals NHS Trust, says:

*The biggest blockage to efficiency is about making change happen. All available resource for making things happen until now has been at divisional level. Service-line management is important in devolving budgets to directorate level and enabling directorates to move faster.*

Kevin Stringer, Director of Finance and Information and Deputy Chief Executive Officer at The Royal Wolverhampton Hospitals NHS Trust, agrees that engagement with efficiency initiatives by senior clinicians is crucial. He argues:

*It is they who decide length of stay, treatment and care options, they spend 80 to 90 per cent of our costs. So we need them on board, hearts and minds.*

The six trusts visited during the present research were at different stages of development with service-line reporting; however, all had moved to greater devolution of financial authority. Barnet and Chase Farm Hospitals NHS Trust has turned its ten directorates into profit centres. Directorates that achieve targets are allowed to keep a percentage of any surplus to reinvest in services, and business units that bring about improvements in their position are granted certain freedoms. David Carter, Director of Finance for the Trust, explains:

*Everyone’s motivation is to spend money, because how you cover your risk is through spending money (more tests, more scans, etc.). The lack of any motivations and levers to restrict spending is a real issue.*

Richard Harrison, Medical Director, agrees: “It shows people how they can contribute to the financial situation of the trust,” adding that clinical colleagues “believe it is the most appropriate method to introduce incentives.”

## Nurse management

Nurses represent the largest health profession, and shortages of nurses have been threatening hospital productivity in a number of countries for a number of years. There is a growing number of studies that link aspects of nurse management (together with nurse/patient ratios and nurse skill-mix) to patient outcomes and nurse satisfaction, but unfortunately there appear to be almost none which include costs or that address questions of efficiency as such. Some studies which find positive effects of nurse

management on nurse and patient outcomes are noted here, because often quality is found to be associated with efficiency (see Chapter 5; some further studies which address nurse/patient ratios, nurse skill-mix and efficiency are noted in Chapter 6).

The label 'magnet hospitals' was applied to a group of US hospitals that were able to recruit and retain nurses successfully during a period of nursing shortages in the early 1980s. The studies in these hospitals identified a set of nurse management and working environment characteristics that were associated with the recruitment and retention of nurses (Scott and others, 1999). They included (among other things):

- a participatory and supportive management style
- 'adequate' nurse staffing
- a decentralised organisational structure
- flexible working schedules
- professional autonomy and responsibility
- planned orientation of staff
- competency-based clinical ladders.

These attributes were quantified subsequently in a 'nursing work index', which was shown to be associated favourably with both nursing and patient outcomes, including nurse turnover, vacancy rates and satisfaction, and patient mortality and satisfaction (Scott and others, 1999; Kutney-Lee and others, 2009). Some of these associations have been reproduced by hospital nursing research in other countries, such as Belgium (Van Bogaert and others, 2009) and the UK (Aiken and others, 2008).

Subsequent research in the US has suggested that mortality and other outcomes for surgical oncology patients in 164 hospitals in Pennsylvania were inversely associated with three separate characteristics of the nurse workforce:

- the working environment – as measured by a revised nursing work index
- nurse education – as measured by the percentage of nurses with bachelor degrees in nursing
- workloads – as measured by nurse/patient ratios (Friese and others, 2008).

Surgical mortality deteriorated sharply with rising workloads when the working environment was poor and only 20 per cent of nurses had bachelor degrees. However, mortality hardly varied with rising workloads when the working environment was good and 60 per cent of nurses had bachelor degrees (Aiken, 2008). Subject to the significant limitation that these inferences are based on cross-sectional rather than longitudinal evidence, this suggests that if reductions in nurse numbers are required, it might be possible to reduce the risk of nurse burnout and rising turnover (Aiken and others, 2002), and to maintain or improve quality of patient care by making nurse management reforms and enriching skill-mix. The authors offer pursuit of recognition of magnet status as a possible way of achieving such reforms (Friese and others, 2008).

### Box 4.3: Staff engagement with efficiency

The incentives that have helped to motivate staff to improve productive efficiency within the six trusts ranged from service-line reporting and opportunities to reinvest profits, to staff recognition and award schemes. Examples include £50 gift vouchers for all staff at The Royal Wolverhampton Hospitals NHS Trust when the Trust achieved an 'excellent' rating, as well as certificates of achievement on infection prevention and a formal staff awards night.

Richard Harrison, Medical Director at Barnet and Chase Farm Hospitals NHS Trust, believes that clinicians in particular need to understand the financial impact of their decisions:

*We have probably got more efficiencies out of the hospital by pointing out to consultants the impact they could have in, for example, seeing patients early in the day and the impact this has on discharge and bed usage.*

Rachel Overfield, Chief Nurse at Sandwell and West Birmingham Hospitals NHS Trust, takes the view that staff who hold the purse strings need to focus on efficiency and cost savings, but that for most staff the priority should be the delivery of quality care. She says:

*Operating at optimal care saves money. Patients will then go home earlier, won't bounce back, will have less need for expensive dressings and antibiotics. I'd much rather switch staff on to quality than costs.*

## Process re-engineering and pathway redesign

From the early 1990s there was much attention paid, especially in the US, to comprehensive 'process re-engineering' in hospitals, drawing on experience in private firms. The idea was to undertake fundamental redesign of work processes in hospitals to achieve radical improvements in the volume, quality and cost performance of services. Most, if not all, of the processes in question were identical to those which remain in the spotlight today: such as redesigning patient pathways, exploiting economies of scale and scope, controlling staff costs and establishing revenue and cost accounts at departmental level.

Reports on the outcomes of hospital re-engineering in the US in the 1990s have been described as 'decidedly equivocal', on the basis of a literature review (Walston and others, 2000). Walston and colleagues added to both the negative and positive evidence by finding that in samples of between 247 and 497 US hospitals which had reported undertaking re-engineering activities in the mid-1990s, cost per patient day relative to that of competitors actually rose on average. However, relative cost per day fell (in some of the regression models tested) for hospitals where re-engineering was undertaken in conjunction with certain process changes, including:

- codification of the re-engineering processes
- utilisation of steering committees or process teams in implementation
- involvement of the chief executive in clinical change in the hospital.

Walston and colleagues concluded that the process of change may be as important as the change instrument in improving performance.



Perhaps the best-known recent example of successful re-engineering in health care in the US is the transformation of the VHA under the leadership of Kenneth Kizer in the mid- to late 1990s (as mentioned previously). The VHA, which provides (along NHS lines) publicly funded and publicly provided health care, exclusively to American armed service veterans, was seen as a failing organisation by the early 1990s. The major restructuring which took place from 1995 involved a number of reforms, including:

- the institution of an integrated service network in each geographical area served by the VHA
- the development of an electronic health record for all patients
- the establishment of a measurement-based, transparent, performance management system
- the adoption of clinical guidelines
- the payment of performance-related bonuses to senior staff.

Following these changes, there were striking improvements in various indicators of VHA performance, including VHA hospital performance. For example, prescribing beta-blockers for acute myocardial infarction patients at discharge rose from 70 per cent in 1994/95 to 98 per cent in 2000. Moreover, cost per patient under the VHA remained fairly constant at about US \$5,000 between 1996 and 2004, whereas cost per patient under Medicare rose from about \$5,000 to \$6,800 (although these comparisons are somewhat clouded by differential changes in patient volume and mix under the two schemes over the period; Oliver, 2007).

There was one large re-engineering project, at Leicester Royal Infirmary in England, during the mid- to late 1990s. The aim was to produce dramatic performance improvements in the hospital through the radical redesign of key processes. A review of this project (McNulty and Ferlie, 2002) suggested that it achieved some improvements in service design and some financial savings. However, the impact on patient care was variable and less dramatic than intended. McNulty and Ferlie concluded that the process of transformation was highly contested in a complex and politicised NHS organisational environment. Another evaluation of this project (Brennan and others, 2005) used routine NHS data from 1994/95 to 1997/98 to compare cost-efficiency changes at the Infirmary with those in a peer group of 22 teaching hospitals in England. It suggested that in terms of crude productivity, the Infirmary was already one of the most efficient teaching hospitals in England when the experiment started, and that it became relatively more efficient during the re-engineering period. There was little evidence from the routine data of quality changes during the period. Even if the observed crude efficiency improvements at the Infirmary can be attributed to re-engineering, it remains open to question as to whether the gains were worth the £4 million spent on the project.

#### Box 4.4: Process re-engineering, pathway redesign

Redesigning work processes and pathways has been an important feature of the efficiency-improving approaches taken by the six trusts. Here are some examples.

St Helens & Knowsley Teaching Hospitals NHS Trust is conducting a pilot in the North West Strategic Health Authority Advancing Quality programme; this aims to standardise pathways for patients with serious conditions, improve quality and reduce costs, re-admission rates, complications and length of stay. An industrial engineer has been appointed to help the trust re-engineer its pathways.

A number of the six trusts cited benefit from participating in the Releasing Time to Care: The Productive Ward guidance (NHS Institute for Innovation and Improvement). “The productive ward has forced people to work differently and think about how things are done,” says Terina Riches, Director of Nursing at Barnet and Chase Farm Hospitals NHS Trust. A 20 per cent increase in the time that nurses spend on direct patient care was observed just six months after introducing the programme at this Trust.

Efficiency savings have been generated at Sandwell and West Birmingham Hospitals NHS Trust with the introduction of a new diabetes care pathway. Diabetologists from the Trust have trained general practitioners (GPs) to better manage patients with diabetes in the community. Referrals to diabetologists have reduced, complication rates among patients are lower, glycaemic control has improved and the health economy has made significant savings. According to Donal O’Donoghue, Medical Director of the Trust:

*There’s an awful lot of slack in the system that can be safely taken out without damaging patient care – 30 to 60 per cent of stuff done to patients should be done elsewhere.*

Mersey Care NHS Trust has been working on its ‘To Improve Mental Health Environments’ (TIME) project, which is a community-focused model and reflects work with the PCT to agree a pattern of inpatient care. New buildings will see 160 beds go over three years. Samih Kalakeche, Director of Integrated Adult Health and Social Care Commissioning for Liverpool PCT and Liverpool City Council, says:

*In order for Mersey Care to enhance their services in the coming years, they need to redefine roles and introduce different ways of working in a community setting.*

There was broad agreement across the trusts that greater collaboration is needed across the health system around pathway redesign. “We can only meet the challenges now by working together. This is about working across systems to develop new pathways,” says Alison Blair, Deputy Chief Executive of NHS Barnet. Redesigning pathways across sectors has the potential to generate efficiencies along the whole care pathway, and improve the efficiency of overall public sector spend. Nigel Edwards, Acting Chief Executive and Director of Policy of the NHS Confederation, says: “Internal efficiency savings give a bit of headroom to then do the more interesting, whole-systems stuff across primary, secondary and community care.”



## Lean production


Lean production, otherwise known as the ‘Toyota Production System’, could be described as a particular type of process re-engineering which emphasises *engaging employees* in the search for better ways of working. It invites employees to study the work processes around them, with a view to identifying both quality defects and wasted resources and coming up with ideas for operational innovations to reduce errors, improve quality and eliminate waste. It is focused on satisfying the wants of consumers and is associated with the idea of continuous improvement in the workplace.

The Lean production approach has been embraced with enthusiasm by many health care organisations in the US, and there are numerous reports of successful outcomes (for example, Jimmerson and others, 2005; Kim and others, 2009; Young and Wachter, 2009). Factors which have been reported as having been associated with one successful Lean project include:

- expert guidance for initial efforts
- leadership by clinical ‘champions’ and senior management
- frontline worker engagement
- the use of metrics to develop and track interventions (Kim and others, 2009).

The Lean production approach has been promoted in the UK by the NHS Modernisation Agency and its successor, the NHS Institute for Innovation and Improvement. The latter has now developed a wealth of guidance material embodying Lean principles under headings such as ‘The Productive Ward’ and ‘The Productive Operating Theatre’. There have been some reports in the literature of successful applications of Lean principles in particular hospitals in England (for example, Fillingham, 2007).

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**Box 4.5: Cost improvement plans**

The present research identified cost improvement plans (CIPs) as a key mechanism by which trusts pursue and release savings. John Adler, Chief Executive of Sandwell and West Birmingham Hospitals NHS Trust, reveals:

*In the end every productivity gain has to appear in the CIP so that we're getting the cash out. Our view is that this is a much more realistic way of going about things than trying to trade your way out of trouble.*

This trust has reduced from one-third to one-fifth the maximum proportion of improvements to cash flows that hospital departments can generate from increasing activity and income. This discourages departments from trading their way out of financial difficulties – which may put PCTs into deficit – and encourages them to make cost reductions by service redesign. It is also incorporating its Quality and Efficiency Programme – its local version of the QIPP agenda – into CIP workstreams. Importantly, the Trust's CIP is aligned to its PCTs' shared financial strategy.

The reason this is so important is that incentives need to be aligned across the system in order to achieve cost reductions of the magnitude required. It is summed up by Donal O'Donoghue, Medical Director of Sandwell and West Birmingham Hospitals NHS Trust:

*We're at a cusp. At the moment our clinical teams are incentivised to increase activity. If you really want to take costs out of the system, then you need to get different parts of the system to work towards the same incentives.*

There is a conviction that it means tackling efficiency improvements across the health system. Mike Lynch, Medical Director at St Helens & Knowsley Teaching Hospitals NHS Trust, argues:

*The big difference between what organisations have had to do before is that they have managed their own change, own CIPs, own redesign. Now it has got to be done on a sub-regional footprint.*

Michael Magee, Partner at PricewaterhouseCoopers, agrees:

*I'm firmly of the belief that the right way to do this is to look at local clusters – probably two or three PCTs and associated providers – and for them to work out together how they will take money out of the system.*

## Key points

- Good leadership is crucial for high performance and efficiency in hospitals, according to a number of case studies. However, it is hard to find much statistical evidence on the effects of leadership on hospital efficiency.
- Unsurprisingly, the present research found evidence that ‘turnaround’ is often, but not invariably, associated with a change in leadership or top managers. Also, initially, there is often a period of command and control by top management, followed by renewed delegation to middle managers as recovery takes hold.
- Certain management characteristics have been found to be associated positively with productivity in both firms and hospitals.
- Manager–clinician cooperation has been linked to low costs and high-quality care in hospitals in a significant number of US studies. The present research in England revealed much support for the adoption of service-line reporting (the delegation of budgets to clinical teams).
- Nurse management appears to be important – together with nurse/patient ratios and nurse skill-mix – for patient outcomes and nurse satisfaction. However, this leaves questions about what the costs and benefits are of investing in different characteristics of the nurse workforce (a topic that is revisited in Chapter 6).
- The wave of interest in process re-engineering, which swept through many American hospitals in the 1990s, seems to have met with mixed success – except when it was accompanied by appropriate management changes.
- There is some evidence that process re-engineering improved relative crude productivity at Leicester Royal Infirmary in the mid-1990s. The present research in England identified several hospitals which were actively involved in re-engineering patient pathways.
- More recently, the Lean production approach has been applied with some success in hospitals in England and the US. The present research identified a number of trusts which cited benefits from participating in the ‘Productive Ward’ initiative.
- The present research also identified a number of initiatives to engage staff more generally in the search for efficiency, especially through quality improvement.
- CIPs have been identified by the present research as a key mechanism by which trusts pursue and release savings.

## 5. Technology adoption

This chapter addresses an issue that is central to the successful clinical and general management of hospitals: the appropriate adoption of new technologies. It suggests that even when the NHS purse strings are being tightened, there are likely to be opportunities to enhance outcomes and reduce costs by speeding up the adoption of affordable new technologies.

Technological change is the most important determinant of improvements in health care and hospital productivity in the medium to long term. However, as mentioned previously, it is often difficult to find opportunities to *reduce costs* with the newest medical advances, because many such advances extend treatment possibilities and most are introduced at premium prices. Nevertheless, some new technologies can lower costs if resources are fully released from displacing older ones, and as others mature their cost-effectiveness often improves, sometimes sharply, as when pharmaceutical patents expire. It is important to try to introduce new, cost-saving technologies quickly and to try to find budgetary room for those which are highly cost-effective but mildly cost-increasing. This is part of the logic behind the efficiency savings which have been proposed by recent NHS operating frameworks (Department of Health, 2009a; 2010c; 2010f).

However, the rate of diffusion of new, cost-effective technologies can be slow and can vary significantly across organisations and countries – even when they appear to be eminently affordable. For example, Beech and Morgan (1992) trace the first favourable trial of day surgery (for hernia repair) in the UK back to 1955, and they point out that the (then) Ministry of Health began advocating day surgery in 1967.<sup>4</sup> Yet there was still a need to recommend use of day surgery to laggards nearly 55 years later (NHS Institute for Innovation and Improvement, 2009).

There may be sound economic, psychological and sociological reasons for the slow diffusion of new technologies. The economic reasons may include:

- waiting for the price to fall
- lack of expertise in the new technology
- the difficulty of releasing ‘fixed’ resources dedicated to older technologies
- the presence of liquidity constraints.

The psychological and sociological reasons may include habitual behaviour and individuals’ reluctance or inability to learn new skills. In relation to the slow spread of day surgery, Beech and Morgan (1992) identify clinical attitudes and a lack of day surgery facilities as having impeded the spread of day surgery.

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<sup>4</sup> Of course, the spread of day surgery did not depend on one technological advance at a point in time, but rather on a series of different innovations in surgery and anaesthetics over a prolonged period.

On variations in the rate of diffusion of technologies across organisations and countries, this report has mentioned already that the wider economics literature contains evidence that such variations go a long way towards explaining the large productivity differences that are observed across firms and countries at any one time. Similar variations can be found across hospitals. Skinner and Staiger (2009) used econometric methods to examine the rate of diffusion of three low-cost treatments for heart attacks (aspirin, beta-blockers and primary reperfusion) across US hospitals between 1986 and 2004. They did this by accessing the Medicare records for 2.8 million heart attack patients over this period, which allowed them to compare treatments and outcomes (one-year survival) by hospital. They found large differences in the diffusion rates of these technologies across hospitals. The hospital quintile with the most rapid propensity to adopt these technologies achieved survival rates at 3.3 percentage points above the hospital quintile with the lowest propensity to adopt – which was nearly one-third of the entire gain in survival between 1986 and 2004. Moreover, there were signs that costs were higher in the low-diffusion hospitals, suggesting that adopting these new treatments might be saving costs as well as improving outcomes. It is possible, for example, that low-cost medical interventions were being substituted for expensive interventionist surgery in the high-diffusion hospitals. They speculate that the reasons for variations in the rate of technology diffusion may be related to variations in management practices of the kind described in Bloom and Van Reenen (2006; see Chapter 4).

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“ There were signs that costs were higher in the low-diffusion hospitals, suggesting that adopting these new treatments might be saving costs as well as improving outcomes

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### Speeding the adoption of new ideas

Given the importance of the rapid diffusion of cost-effective and affordable technologies for hospital productivity, it is desirable to understand what determines variations in rates of diffusion and what might be done to increase them, where appropriate. This is a very large topic which is only touched upon here. Stocking (1992) has discussed the determinants of technology diffusion in health care, drawing on a classic study by Rogers (1983), who identified heterogeneity in rates of adoption of technology across farmers. A given new agricultural technology is likely to be viewed differently by individual farmers depending on characteristics such as its apparent relative advantage, compatibility with values and needs, complexity, observability and ability to be trialled. There is generally a forward-leaning, S-shaped curve in the uptake of an innovation over time, with ‘innovators’ leading the way in the lower, flat tail of the curve followed by ‘early adopters’, ‘early and late majorities’ in the steepest part of the curve and ‘laggards’ in the upper, flat, tail. Research on technology adoption by farmers suggests that these different groups are distinguished by their personal characteristics, values, social relationships and communication behaviour. Similar factors are almost certainly at work in medicine. For example, under ‘personal characteristics’, Choudhry and others (2005) have reported on the basis of a literature

review of 62 rather heterogeneous studies, that older doctors tend to have less factual knowledge, are less likely to adhere to appropriate standards and may have poorer patient outcomes than younger doctors.

Stocking (1992) discusses a number of strategies for increasing the rate at which new (cost-effective) technologies diffuse across medical practitioners, including:

- providing information
- education
- peer review and audit
- person-to-person contact
- financial incentives.

Information may be a necessary condition for change, but is unlikely to be sufficient. Continuing medical education and revalidation of licences<sup>5</sup> is clearly relevant to the older doctor phenomenon mentioned previously. Audit of clinical practice with feedback to doctors may be less effective than person-to-person contact. Stocking reports a Canadian study (Lomas and others, 1991), which suggests on the basis of a controlled trial of vaginal delivery versus caesarean section in women who had already had one baby by caesarean section, that encouragement of practitioners by local medical opinion leaders or champions, chosen by the doctors themselves, was effective in changing practice, unlike audit and feedback. Financial incentives also may be successful in changing practice, judging, for example, from the way that GPs in England responded to the new pay-for-performance contract introduced in 2004.

The topic of disseminating innovations in health care has been reviewed exhaustively under Department of Health auspices more recently (Greenhalgh and others, 2004: p28). Greenhalgh and colleagues draw a number of conclusions, but they eschew 'formulaic, universally applicable recommendations for practice and policy'. Rather, they stress the contingent and contextual nature of dissemination and highlight remaining gaps in knowledge about the process of diffusion.

### Financial pressure and technology diffusion

An important question arising from the situation facing the NHS in 2010 is whether increased financial pressure in the future will tend to slow the rate of adoption of new, cost-effective technologies, inhibiting potential improvements in productivity. All other things being equal, the answer to this question is likely to be 'yes'. Tightening the health budget will raise the cost-effectiveness threshold for assessing any new technology, potentially squeezing out of consideration some (marginal) new technologies. Also, a tighter budget will make it more difficult to afford any medical advances which will add to expenditure. However, as noted previously, recent and current NHS operating frameworks (Department of Health, 2009a; 2010f) envisage that some of the efficiency savings that will be required over the next few years will be ploughed back into the NHS, which should allow for some additional adoption of new, cost-effective technologies.

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<sup>5</sup> The Department of Health announced, in January 2010, the establishment of ten pilot projects for a system of revalidation of doctors' licences every five years by the General Medical Council.

### Box 5.1: Innovation and technology diffusion

NHS managers repeatedly demonstrated a genuine appetite to invest in new efficiency-improving technologies. “Adversity encourages innovation because people are trying to maintain the values around patient safety and quality,” says Antony Sumara, former Chief Executive of Mid Staffordshire NHS Foundation Trust. Examples of the type of investment made by the six trusts when they were in deficit, or barely out of it, include the following.

- Robotic dispensing systems at Barnet and Chase Farm Hospitals NHS Trust and also at St Helens & Knowsley Teaching Hospitals NHS Trust, which have enabled patients to be discharged faster by reducing waits for medicines to take home, decreased dispensing errors and released pharmacy staff to spend more time on wards.
- Automated drug cabinets on the wards at Mersey Care NHS Trust, which led to an award for innovation for the Trust and has increased the availability of medicines and strengthened safety (a webcam enables pharmacists to check prescriptions remotely).
- A Potchi machine at Mersey Care NHS Trust, which performs a blood test in a community setting and delivers the results and a prescription within three minutes – previously this would take a week.
- Paperless clinics at St Helens & Knowsley Teaching Hospitals NHS Trust are expected to reduce delays for patients, increase safety and save the trust £2 million a year recurrently in storage and secretarial costs.
- Mid-Staffordshire NHS Trust and Sandwell and West Birmingham Hospitals NHS Trust have increased the capacity and turnaround times of many blood tests, with robots helping staff to analyse 3,000 samples each day.
- A Picture Archiving Communication System has helped to reduce waiting times to a fortnight for radiology at Sandwell and West Birmingham Hospitals NHS Trust.

Mersey Care NHS Trust has used a ‘Dragon’s Den’ style approach to consider proposals to invest in new technologies. Clinicians have also undertaken social enterprise training in ‘the elevator pitch’ to hone their skills in this area. A multidisciplinary group called ‘Breathing Space’ has been set up for staff with an entrepreneurial streak to explore new ideas and to learn from other sectors, such as manufacturing.

Only one study (Hirth and others, 2000) was unearthed during this review which addresses empirically the question of whether and to what extent technological change continues to be adopted in health care systems under severe and prolonged financial constraints. In the US, renal dialysis is funded nearly universally for all patients who can show a need for it, under the federal social health insurance programme Medicare, and is supplied by both for-profit and not-for-profit providers between whom patients can choose, subject to local availability. The nominal per-treatment price (and, in effect, the capitation payment) was kept almost constant for 30 years under Medicare, leading to a decline in the real price of more than 70 per cent.<sup>6</sup> Yet providers continued to adopt certain new, quality-enhancing dialysis technologies (such as bicarbonate dialysate and high-efficiency membranes) under these financially restrictive circumstances. The providers accommodated the additional cost of these new

<sup>6</sup> Meanwhile, the *volume* of dialysis expanded in response to demand in an open-ended way. In 2007, the rate of renal dialysis per 1,000 population in the US was nearly three times the rate in the UK, where renal dialysis has to compete with other programmes for a limited NHS budget (OECD, 2009). This gap in provision is likely to have less to do with any differences in productive efficiency, and more to do with the undoubted differences in approaches to allocative efficiency with regard to renal dialysis in the two countries.



technologies by making adjustments on other quality and cost dimensions. Membrane re-use increased and staffing per patient decreased. Stations per patient remained the same. There were interesting differences in the adjustments made between for-profit and not-for-profit providers. For-profits tended to deliver lower technical quality of care but more amenities whereas not-for-profits favoured higher technical quality of care over amenities. Undoubtedly the NHS has made many similar compromises and adjustments over the years to try to accommodate continuing technical change in a climate of restrictive budgets – probably with a bias towards technical quality of care at the cost of amenities.

### Key points

- The adoption of new technologies seems to be the main source of productivity improvements in firms and in health care over time, yet rates of adoption can vary widely across hospitals.
- The reasons for varying rates of technology diffusion in health care do not appear to be very well understood, but there is some evidence that promotion of specific new techniques by local clinical leaders can speed up adoption locally.
- The present research has shown up an enthusiasm for innovation and many examples of the adoption of new technologies in the sample of turnaround hospitals. However, it should be noted that the relevant experience relates to a period when NHS budgets were expanding.
- A tightening of the NHS purse strings could inhibit the adoption of the most expensive (and marginally cost-effective) technologies over the next few years. However, there is one American study that suggests that innovations continue to be adopted, despite a prolonged and tight squeeze on the payment tariff.
- The current NHS operating framework envisages the recycling of some NHS savings into new innovations.
- The present research revealed a belief among some managers that ‘necessity will be the mother of invention’.

## 6. Hospital operational processes

This chapter and the next turn to the heart of the efficiency question: hospital processes. The next chapter deals with labour productivity; this one examines other hospital processes that appear to have been associated with gains in productivity, including:

- expanding activity despite a squeeze on resources
- getting care right first time
- increasing day-case surgery
- shortening length of stay
- managing estate costs.

### Hospital processes

Improving hospital efficiency is a matter of changing productive processes to increase output (including quality) for any given level of inputs, or to reduce one or more input for any given output.

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“ The weight of evidence from recent US studies...points to the existence of positive statistical associations between quality and efficiency

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The opportunities to improve efficiency in any one hospital will depend very much on the initial conditions in that hospital: for example, on whether there is slack in any inputs, whether there are problems with the quality of care, whether a sub-optimal mix of inputs has been chosen or whether there has been failure to adopt the most cost-effective set of affordable technologies. They will depend also on the timescale available for change: in the short run, some resources and costs will be fixed; in the long run, all resources and costs can be varied. Moreover, the opportunities will depend on changing external circumstances such as whether demand or budgets are expanding or contracting, and whether new, cost-effective and affordable technologies have become available. Experience suggests that invariably there is variation across hospitals in the relevant parameters, and that usually benchmarking can help to point towards the efficiency frontier.

### Box 6.1: Hospital processes for improving efficiency

The experiences of the six trusts demonstrate that increasing efficiency requires simultaneous action on a number of fronts. The tactics to improve efficiency within the acute trusts included the following:

Activity and productivity	<ul style="list-style-type: none"> <li>• Increasing day cases</li> <li>• Reducing bed numbers, increasing bed occupancy and closing theatres</li> <li>• Reducing length of stay or preoperative length of stay</li> <li>• Improving management of waiting lists</li> <li>• Improving theatre utilisation</li> <li>• Improving new to follow-up ratios for outpatients</li> <li>• Improving recovery of chargeable patient activity</li> <li>• Reducing cancelled operations</li> <li>• Reducing the number of people who do not attend outpatient appointments.</li> </ul>
Staff productivity	<ul style="list-style-type: none"> <li>• Reducing staff numbers and the use of band and agency staff</li> <li>• Skill-mix review.</li> </ul>
Improving quality	<ul style="list-style-type: none"> <li>• Avoiding harm (for example, infection prevention)</li> <li>• Redesigning pathways and the way things are done, for example, 'The Productive Ward'/'The Productive Theatre'</li> <li>• Eliminating unnecessary tests.</li> </ul>
Diagnostics	<ul style="list-style-type: none"> <li>• Improving the use of diagnostics – for example, pathology, radiology and endoscopy.</li> </ul>
Medicines and equipment	<ul style="list-style-type: none"> <li>• Using generic rather than branded drugs</li> <li>• Rationalising stock levels on the wards</li> <li>• Standardising the procurement of medical supplies.</li> </ul>

'Quick wins' for the acute trusts included rationalising stock levels on the ward, better management of waiting lists and driving down length of stay.

Some efficiency initiatives were unsuccessful, took longer than expected to deliver improvements or were simply not worth the effort. For example, at Barnet and Chase Farm Hospitals NHS Trust, some savings were made by reducing the number of medical secretaries, but Chief Executive, Averil Dongworth, reflects: "This caused a lot of problems and while we saved some money, the quality of communications suffered." This was not the only trust to have experienced problems as a result of efforts to improve efficiency with its administrative support.

## Expanding activity versus reducing costs

From 2009 the NHS was required to switch, in effect, from seeking efficiency gains that could boost activity and quality in the circumstances of rising total expenditure, to seeking efficiency gains that would realise expenditure savings, to be reinvested in quality and innovation, in the circumstances of stationary total expenditure.

Efficiency can rise because activity increases faster than costs, or falls less rapidly than costs. As has been noted previously, there is ample evidence that crude hospital productivity has increased at times of financial squeeze in various health systems due to rising activity (Appleby, 1999; Bazzoli and others, 2004–05). It follows that during contractions, for any increase in hospital efficiency, cost reductions will be incentivised if activity rises are constrained or discouraged. Presumably this is part of the logic behind the measures which are intended to restrain the growth in hospital activity as set out in *The Operating Framework for the NHS in England 2010/11* (Department of Health, 2009a). At the same time, if activity restraint is successful, it may inhibit some of the crude efficiency ‘bounce’ which has been traditionally associated with NHS contractions. However, it is possible that quality gains might be higher than in previous ‘bounces’ if savings are successfully recycled into new technologies.

## Getting care right first time

It has been often suggested that avoiding harm and promoting quality of care in health care will improve efficiency because ‘doing things right first time’ will avoid unnecessary costs, as well as achieving good clinical outcomes and patient satisfaction. However, it can be pointed out that raising quality beyond a certain point is likely to add more to costs than to benefits, thereby reducing efficiency. To what extent are quality and efficiency complementary, and to what extent are they in competition with one another?<sup>7</sup>

The weight of evidence from recent US studies that have examined both clinical quality of care (measured partially and in various ways) and efficiency (measured by frontier techniques) across US hospitals, points to the existence of positive statistical associations between quality and efficiency after controlling for other measurable factors (see Deily and McKay, 2006; Harrison and Coppola, 2007; Huerta and others, 2008; Nayar and Ozcan, 2008; Valdmanis and others, 2008). In addition, as noted previously, Skinner and Staiger (2009) found evidence of a positive association between quality and efficiency (or strictly, an inverse association between quality and cost) in their interrogation of 2.8 million longitudinal Medicare records for heart attack patients in the US.

In contrast, Jha and others (2009) found modestly worse process quality for certain conditions in low-cost hospitals in the US but comparable rates of risk-adjusted mortality, where efficiency was measured using the ratio of observed to expected cost per case. Pink and others (2003) found that patient satisfaction in hospitals in Ontario was inversely associated with the ratio of actual to expected cost per case, although the magnitude of the effect was small and it was swamped by the effects of other hospital characteristics on satisfaction.

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<sup>7</sup> Of course, it is possible to adopt an engineering approach in the search for safety and quality in health care by proposing the pursuit of absolute standards such as ‘Six Sigma Quality’ (reducing error rates to below 3.4 adverse events per million patients). The implications of pursuing such standards are not investigated here.

### Box 6.2: Expanding activity

Expanding activity and the better recording of activity, accompanied by income growth, have been important determinants of increases in performance – measured by a reduction in reference costs (defined in Appendix C) in all of the acute trusts in the present sample.

- The Royal Wolverhampton Hospitals NHS Trust has seen its income jump by 44 per cent in the previous three years. It attributes this to growth in demand within existing markets, the availability of new treatments, and a strategy to increase market share and push outside of the patch. “We’ve been growing in a growing market,” says Kevin Stringer, Director of Finance and Information and Deputy Chief Executive Officer.
- Sandwell Primary Care Trust (PCT) Chief Executive, Robert Bacon, reported that the amount that the PCT pays Sandwell and West Birmingham Hospitals NHS Trust has increased, despite substantial improvements around efficiency and quality. He says:

*It’s absolutely true to say that they’ve become far more efficient – you can see this in the reduction in bed numbers and in how they have driven down length of stay, [but] the overall cost to the health economy has gone up.*

Undoubtedly, the 18-week waiting time initiative has increased activity in the acute sector, and expansion has been further encouraged by Payment by Results. Acute and specialist trusts’ income growth has more or less matched what PCTs have had available to spend (Audit Commission, 2008).

A lack of synergy is apparent between commissioners’ objectives to create efficiencies across the health system, and an objective on the part of some acute trusts to pursue activity. For example, Mike Treharne, Director of Financial Strategy at NHS Halton and St Helens PCT, reports that St Helens & Knowsley Teaching Hospitals NHS Trust increased its income by 22 per cent over one year, when the PCT received only 11 per cent (or 5.5 per cent a year). Moreover, the acute trust seeks to increase its income by increasing activity, and yet PCT plans include a significant shift to more local, out of hospital care.

Many of the acute and mental health executives recognised that it is not a sustainable strategy to continue increasing activity. However, in practice, the challenge for acute trusts will be in limiting activity at the same time as achieving the efficiencies that the tariff requires. Jan Filochowski, Chief Executive of West Hertfordshire Hospitals NHS Trust, with experience of leading three trusts through turnaround, challenges the assumption that acute trusts will be able to limit activity or halt the “relentless upward surge in demand”. He says:

*Where we can make savings, we will and have been doing. People are staying in hospital for shorter and shorter lengths of time, and less invasive procedures mean some care can be done in the community – but there is too much ideology that too much can be done in the community.*

#### Reducing costs

As noted in Chapter 5, there was widespread agreement among NHS executives that future efficiency improvements need to be cash-releasing, which means reducing capacity and taking costs out of the system. Kevin Stringer, Director of Finance and Information and Deputy Chief Executive Officer at The Royal Wolverhampton Hospitals NHS Trust, remarks:

*Productivity gains in terms of extra activity won’t translate into cash gain, so we’re going to have to go much harder at taking costs out – staffing levels, staffing skill-mix, patient pathways of care, waste, inefficiency and duplication. We’ve got to get things right first time, every time.*


Jon Crockett, Chief Executive of Wolverhampton City PCT, agrees:

*Efficiency for efficiency’s sake doesn’t work. The only way you ultimately take costs out is through fewer staff and fewer beds.*

(Some of the practical steps which had been taken to realise cost savings in the six trusts are listed in Box 6.1.)

If all hospitals were equally efficient and remained so, negative associations would be found between clinical quality and efficiency because activity and quality would have to be traded off for given inputs, or quality and costs would have to be traded off for given activity. However, it appears that hospitals are far from equally efficient, probably because of differences, among other things, in their management culture and/or their rate of adoption of new, cost-effective, affordable technologies. This makes it possible for an *indirect* and positive association to appear between efficiency and quality, as both react favourably to better management and the speedier adoption of cost-effective technologies.

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 It has been estimated that adverse events occur in 1 to 3 per cent of all hospital admissions

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Where does this leave the argument that there is a *direct* connection between quality and efficiency – because ‘doing things right first time’ and avoiding adverse events can save costs? Of course, there is much evidence about alarmingly high rates of adverse events in hospitals and about the overuse, underuse and misuse of hospital procedures. For example, it has been estimated that adverse events occur in 1 to 3 per cent of all hospital admissions, according to studies from a variety of countries – far above the level in other potentially risky industries such as aviation (Kohn and others, 1999; Mattke, 2004). It is clear from the US literature that adverse events are associated with excess deaths and excess charges per admission (Zhan and Miller, 2003). They are associated also with excess re-admissions (Friedman and others, 2009). However, interventions to raise quality themselves will have costs, and it is an open question in each instance as to whether the benefit gains and cost savings from such interventions will exceed the initial outlay. In an American review article, Kilpatrick and others (2005) concluded that there was simply not enough evidence to establish whether there is a business case for most quality interventions: that is, whether positive financial returns are available.<sup>8</sup>

In his report for the Health Foundation in the UK, Ovretveit (2009) came to a similar conclusion about the general lack of evidence to establish that quality interventions can save costs. Nevertheless, he identifies a shortlist of quality interventions for which net savings have been established. Of course, it is not necessary for quality interventions to save money for them to be worth adopting, on paper – they merely have to be more cost-effective than alternative uses of resources. However, at a time of dwindling overall resources, it may be difficult for new quality initiatives that incur additional costs to displace established, if less cost-effective, uses of resources.

As noted previously, a study by Valdmanis and others (2008) is among those which have found a positive relationship between quality and efficiency in American hospitals. This study established that the 1,377 hospitals in the sample could have increased the total amount of outputs by 26 per cent on average in 2004 by eliminating inefficiency. Only about 3 percentage points of this inefficiency was due to adverse events sensitive to nurse

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<sup>8</sup> The same authors also point out that hospitals may not be incentivised financially to invest in quality – a state of affairs that could change if pay-for-performance were introduced.



staffing in the hospitals – the measure of quality used in the study – suggesting that the direct effects of quality on inefficiency which were identified were relatively small.

### Increasing day surgery and reducing length of stay

Two important process changes which can permit activity to be increased and inputs to be reduced are increasing the day surgery rate and reducing the average length of stay in hospitals. It is clear from studies such as the National Beds Inquiry (Department of Health, 2000) that the gains in productivity in the Hospital and Community Health Services (HCHS) in the 1980s and 1990s, as noted previously, were due at least partly to a combination of rising day surgery and falling length of stay. At a time (1980–94) when overall admissions were rising by 3.4 per cent a year, day surgery admission rose by 12.4 per cent a year, whereas average length of stay fell by 3.3 per cent a year. Partly as a result of these two trends, the number of acute and general beds fell by 2.6 per cent a year over the same period.<sup>9</sup>

#### Box 6.3: Improving quality, reducing costs

In contrast with the literature review evidence, some of the trusts in the present research reported reaping savings from making quality improvements, and there was a great deal of support among NHS executives for a link between improving quality and reducing costs. “The answer to all productivity issues is: focus on the patient, get things right, and savings will fall out of that,” says Antony Sumara, former Chief Executive, Mid Staffordshire NHS Foundation Trust. The most significant example of quality initiatives leading to efficiency gains at the six trusts was activity to improve infection prevention.

The Royal Wolverhampton Hospitals NHS Trust is a good example of this. It went from being one of the worst performers nationally on infection prevention to one of the best, and reduced its mortality rate from 111 to 92 in three years. Brian Millar, Medical Director, says:

*We did all the things you're supposed to do: reduced length of stay and preoperative stays, cut out agency staff, increased day cases, etc. These were the right things to do, but the biggest thing was driving down infection.*

The efficiency benefits included reductions in length of stay by 2.2 days and in the use of costly antibiotics. Millar recalls:

*Six months later we saw the money come falling out of the sky. Length of stay was going down, costs in imaging, diagnostics and antibiotic therapy were all coming down.*

The savings in bed days enabled the Trust to reduce its bed base by 200. On *C.difficile* alone it claims to have saved 212 lives annually and 16,000 bed days, equating to £7.8 million in savings. It is now extending its focus to preventing other types of harm, including patient falls, medication errors, peri-operative care and the deteriorating patient.

The executives at the six trusts demonstrated a genuine commitment to preserving quality, and regarded it as a business imperative that would be important in future to attracting scarce resource. In critical times, the onus on the NHS to make the right decisions, first time, will become even greater.

<sup>9</sup> However, it should be pointed out that the productivity changes in the HCHS in this period were not pure gains from a whole-system viewpoint. Much of the decline in length of stay was made possible only by establishing an initially open-ended social security programme in the 1980s, which funded additional places in residential and nursing homes to which long-stay hospital patients could be transferred. There was a steep rise in private nursing home beds (Hensher and Edwards, 1999).



Although average acute length of stay has declined for many years in the UK, recent OECD comparisons (which exclude day cases) suggest that average stay in the UK, at 7.2 days in 2007, remained well above the OECD average at 6.5 days. The US reported 5.5 days, Sweden reported 4.5 days and Denmark 3.5 days (OECD, 2009). Denmark, incidentally, is a country which is renowned for the quantity and quality of its long-term care services. It also has a significant number of specialists working in the community outside hospitals (Hurst, 2002). These comparisons suggest that there may be scope for further reductions in average length of stay in the UK – perhaps depending on the provision of additional domiciliary, residential and nursing home capacity.<sup>10</sup> The NHS Institute, like its predecessor, the NHS Modernisation Agency, continues to advocate increases in day surgery and reductions in length of stay on a shortlist of areas with potential for productivity improvements (NHS Institute for Innovation and Improvement, 2006).



There is evidence from the US literature that shorter length of stay has played a part in improving efficiency

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There is evidence from the US literature that shorter length of stay has played a part in improving efficiency in US hospitals. As noted previously, Rosko (2004) found an increase in efficiency in a sample of US teaching hospitals following implementation of the Balanced Budget Act in 1997. Younis and Forgione (2009) looked at approximately 4,000 hospitals over the period 1996–2000 and found a reduction in average length of stay for Medicare patients following implementation of the Act, after controlling for other determinants of length of stay. Bazzoli and others (2004–05), who examined the effect of the Act on 1,218 acute, non-profit hospitals between 1996 and 1999, also reported reductions in length of stay, but found no difference in the rate of reduction between hospitals experiencing more financial pressure and those experiencing less.

A Norwegian study (Martinussen and Midttun, 2004), which used frontier techniques to measure variations in hospital efficiency across 51 hospitals, has suggested that increasing day surgery was positively and significantly linked to hospital efficiency over the period 1999–2001, after controlling for certain other determinants of efficiency. More specifically, an increase in the day surgery rate of about 10 per cent was associated with an increase in the efficiency index of 1.64 percentage points. Unexpectedly long lengths of stay were negatively associated with efficiency. This study was not able to control for quality or to take account of any whole-system effects.

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<sup>10</sup> Unsurprisingly, there were signs of an inverse association between the percentage of the population over 65 living in non-hospital institutional care and the average acute hospital length of stay, across OECD countries for which data were available (OECD, 2007).

The NHS Institute provides data, which is regularly updated, for NHS acute providers to benchmark themselves in respect of length of stay and day case surgery rates (among other indicators). It also provides estimates of the savings that could be made if lengths of stay above the median were reduced by 25 per cent and day surgery rates below the upper quartile were increased to the upper quartile (see NHS Institute for Innovation and Improvement, 2009).

#### Box 6.4: Increasing day surgery and reducing length of stay

- The Royal Wolverhampton Hospitals NHS Trust went from being in the bottom 25 per cent of the country for day cases in 2005/06 to having all but one procedure meet targets for day cases, and six procedures performing among the top 5 per cent in the country the following year. It also reduced preoperative length of stay and cancelled operations by half during 2006/07.
- Sandwell and West Birmingham Hospitals NHS Trust saw its average length of stay fall from 6.4 days in 2005/06 to five days by 2007/08, and an increase in the proportion of planned work undertaken as a day case or short stay from 88 per cent in 2006/07 to 92 per cent in January 2008.
- Barnet and Chase Farm Hospitals NHS Trust considers 'Discharge Jonah', a decision-making tool that identifies blocks in the patient pathway, to be its most successful initiative in terms of improving efficiency. "It helped to explode some of the myths about where the problems were," says Chief Executive Averil Dongworth. Within the first year it was credited with reducing the number of days of delayed discharge by half (Barnet and Chase Farm Hospitals NHS Trust, 2007).

### Bed numbers, Private Finance Initiative schemes and efficiency in estate use

The period of gains in the efficiency of the NHS in the 1990s was associated with bed reductions (Department of Health, 2000). To the extent that the current NHS operating framework (Department of Health, 2009a) will put downward pressure on both the volume of growth and the price of hospital services over the next three to four years, eventually reductions in capacity will be necessary if trusts are to remain efficient. However, it will be difficult to reduce capital inputs such as buildings and land over such a period, especially if only parts of a site become surplus to requirements. Wards and other facilities can be closed or mothballed, but capital charges can remain. In other words, at times of contraction, building and land costs can impose diseconomies if services are not concentrated on fewer sites, for example. The NHS Confederation has pointed out that it will assist in making savings if whole sites can be closed, and The King's Fund has concluded that reconfiguration across hospital sites is the only way that some trusts can achieve financial balance while avoiding unacceptable deterioration in quality of care over the next five years (Palmer, 2011).

If downsizing is expected to be permanent or there are already plans in the pipeline for rationalising facilities which can be modified, it may be possible to concentrate services on fewer sites, at least in large urban areas, in the required timescale, thereby releasing buildings and land and restoring the remaining hospitals to something like their former average size before the contraction. However, from a whole-system viewpoint, such concentration is likely to have adverse effects for patient access. In addition, it may have adverse effects for competition, which could impact negatively on efficiency, judging by some of the studies cited elsewhere in this report.

Private Finance Initiative (PFI) schemes, which provide, typically, private premises, equipment and cleaning and catering services to the NHS on long-term contracts, represent a new and growing challenge in the search for savings. There are approximately 100 PFI schemes in the NHS at the time of writing, and there are more in the pipeline. PFI schemes can commit trusts to substantial annual payments for up to 30 years. They usually cost more than the equivalent public provision – perhaps because they provide a higher standard of service – and they frequently represent between 5 per cent and 15 per cent of a PFI trust’s income. The Audit Commission (2006) has identified an association between large new building projects (mostly PFI schemes) and financial deficits in the NHS. There is relatively little flexibility in PFI contracts, and because of this it has been suggested that there will be pressure to concentrate hospital activity on PFI sites at the expense of non-PFI sites if there is contraction (Hellowell and Pollock, 2007).

In addition, there is the question of reducing waste in the NHS estate. In a novel and preliminary analysis, May and Price (2009) used frontier analysis to compare total income and patient-occupied area per unit site-area across 115 acute trusts, among others.

Of the trusts, 92 appeared to be more than 10 per cent inefficient, and 63 were more than 20 per cent inefficient. May and Price estimate that wasted space across the whole NHS estate might be costing £500 million a year.

#### Box 6.5: Reducing bed numbers

At the six trusts there were bed reductions made in the interests of saving money. These are likely to have been associated with gains in efficiency, given the reductions in length of stay mentioned previously. However, the capacity that was taken out was often less than it might have been, due to increases in activity made in the interests of raising income.

- Sandwell and West Birmingham Hospitals NHS Trust treated more patients despite having 150 fewer beds, and saw its income soar.
- Barnet and Chase Farm Hospitals NHS Trust took out 100 beds in its first year of turnaround and then pushed bed occupancy higher.
- The Royal Wolverhampton Hospitals NHS Trust closed 200 beds and four theatres. The increase in activity for this Trust (in all areas except A&E), combined with the dramatic rise in income, suggests efficiency improvements and a smaller acute footprint despite the increase in activity.
- St Helens & Knowsley Teaching Hospitals NHS Trust closed 150 beds while increasing its income from activity.

### Box 6.6: Private Finance Initiative schemes

A number of the trusts reflected concern about meeting the fixed costs associated with a PFI build. New facilities designed for health care should have efficiency benefits (such as improving patient flows and reducing the resources tied up in infection control), but the ability of trusts with PFI estate to take costs out of the system may be constrained by the pressure of the unitary payment, which shifts more of the costs into being fixed.

About 15 per cent of St Helens & Knowsley Teaching Hospitals NHS Trust's costs were due to become fixed on completion of its PFI project. Damien Finn, the Trust's Director of Finance, Information and Commercial Services, says:

*We've designed and built a hospital based on four- to five-year-old planning assumptions on what the future will hold. Like any business, the way we're going to deliver that is to drive through activity.*

A key element of the Trust's strategy is to capture more than £20 million of activity in its local catchment population that is currently performed elsewhere. Finn maintains that there is little opportunity to rationalise PFI estate.

Mike Treharne, Finance Director of Halton and St Helens PCT, argues that trusts with PFI builds can still reduce activity by 'hub-and-spoke' arrangements and incentives to keep people out of hospital. The surplus areas could be used, then, for community facilities or private ventures. "However, this is not possible without a joined-up strategy with commissioners and other providers to properly and appropriately reduce system capacity," he adds.

If acute capacity is to be reduced, there could be an argument for retaining PFI builds designed for modern health care provision over ageing hospital estate.

## Economies of scale, hospital mergers and sharing back office functions

To the extent that there are already plans to rationalise hospital capacity in the pipeline which can be accelerated, and to the extent that there is space that can be freed up on some existing sites, there may be the possibility to go further and concentrate services on even fewer sites than would be required to adjust for contraction, thereby increasing the average size of hospital. This raises the question of the existence of economies or diseconomies of scale in hospitals.

Operating hospitals at the right scale and with an optimum mix of departments can be an important source of efficiency. However, from a whole-system viewpoint, if the scale of operations is to be changed, there will be trade-offs to be considered between clinical quality, cost per case and access for patients (Bloor and others, 2000). As hospitals increase in size and decline in numbers in any given geographical area, there may be gains in clinical quality (from volume and clinical concentration effects); there may be other economies or diseconomies in scale which affect cost per case; and there will be reductions in access for patients, as the average distance of the population from the hospitals increases.

There is a voluminous literature relating to a wide range of diseases, which finds positive associations between clinical outcomes and the volume of specific treatments

undertaken across hospitals. However, comprehensive, critical reviews of this literature both in the US (Halm and others, 2002) and in the UK (NHS Centre for Reviews and Dissemination, 1996) have concluded that many of the studies lack methodological rigour, mainly due to inadequate risk adjustment. Patient selection may explain some or all of the positive associations found between volume and outcomes. The studies which control better for risk tend to find smaller effects.

There is also a large literature on the effect of changes in size on unit costs in hospitals. Reviews suggest that cost per case declines as hospitals increase in size to about 200 beds. There appear to be roughly constant returns to scale between 200 and 600 beds; however, above approximately 600 beds diseconomies of scale seem to set in, possibly because larger hospitals become more difficult to manage. All of the studies concerned make either no measurement or incomplete measurement of the quality of care.



It is for policy-makers to weigh the likely trade-offs that exist between clinical quality, cost per case, access costs and competition as hospitals increase in size

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In addition, there is copious evidence that patient access declines with distance from hospital ('distance decay'). The evidence on the effects of this on outcomes is mixed. However, concentration of hospitals almost certainly transfers costs from hospitals to patients, as access becomes more difficult for some.

Moreover, there may be deleterious effects on efficiency through the weakening of competition if there are fewer hospitals further apart. It is for policy-makers to weigh the likely trade-offs that exist between clinical quality, cost per case, access costs and competition as hospitals increase in size.

There are a handful of studies (such as Harris and others, 2000; Ferrier and Valdmanis, 2004; Fulop and others, 2005; Kjekshus and Hagen, 2007), some using frontier techniques, which have investigated the effect of hospital mergers on the efficiency of hospitals, but the results fail to find statistical significance or are mixed. Dickinson and others (2006) reviewed the literature on best practice in organisational mergers and transitions from an NHS perspective, and identified a need for different styles of management at specific stages in the merger process. They also identified a need for a relentless focus on management of the human aspects of transition, in order to mitigate the likely dips in performance that come with a process of major organisational change.

One way that economies of scale may be achieved is through hospital cooperation, which does not actually involve consolidation of all services on one site, at least in the short run, but allows a reduction in the duplication of services – such as back office services – and concentration of purchasing power. As part of the QIPP national workstream, the Foundation Trust Network has reviewed the scope for making efficiencies in NHS back office functions such as finance, human resources, information management and technology and estates. It has identified the scope for releasing potentially £600 million a year for front-line services by sharing back office functions across NHS organisations, and by other methods of streamlining such services (Foundation Trust Network, 2010).

### Box 6.7: Reconfiguration of hospital services

There was widespread agreement among NHS executives that major reconfiguration of hospital services will be necessary to take acute capacity out of the system. Michael Magee, Partner at PricewaterhouseCoopers, says:

*You cannot drive anything like the efficiency [required] without taking out some infrastructure. If NHS organisations are to make efficiency improvements of 15–20 per cent, there will have to be less infrastructure.*

A number of the six sites had embarked already on their own reconfigurations. For example, Sandwell and West Birmingham Hospitals NHS Trust is in the process of downsizing. It will benefit from the development of a new PFI hospital in 2015 to replace two existing hospitals, but with 300 fewer beds (it has already reduced its beds by 300). Its PCT is identifying a growing list of work that it no longer wishes to commission, and the plan is based on high levels of productivity and efficiency, including high day cases, new to follow-up ratio<sup>11</sup> and low length of stay.

The two mental health trusts that the present study visited, and others it examined as part of the shortlisting of mental health trusts, had combined short-term efficiency actions with long-term strategies to remodel services. Reflecting on North East London NHS Foundation Trust, Nigel Beverley, Chief Executive of NHS Enfield, remarks: “A very different discussion is taking place: more community-based and focused on rationalisation of inpatient services.” A radical change in direction from its core services is the priority for North East London NHS Foundation Trust. Its Chief Executive, John Brouder, believes that there are limited opportunities left to increase efficiency in the Trust’s core portfolio beyond centralising inpatient services in response to a continuous reduction in demand for admission and in length of stay. Instead the Trust is diversifying into new markets, including greater integration between psychological and physical health with integrated mental health, community and primary care services, as well as eating disorder services, new care pathways (such as for diabetes) and running polyclinics. The Trust has already taken on all community services for one of the PCTs in its patch, and has ambitions to ‘cherry-pick’ services from other PCTs.

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<sup>11</sup> A form of measurement of attendances at outpatients – the number of new patients in relation to the number of returning patients.



## Key points

- At the heart of the hospital efficiency question is the potential to change the processes of production to increase outputs for given inputs, or to reduce inputs for given outputs. The possibilities will depend on the initial conditions in a hospital, the timescale available for change and external circumstances.
- Historically, it seems that activity increases have been the main source of improvements in crude productivity in NHS hospitals during budgetary contractions. During the forthcoming contraction, if activity increases are constrained successfully, there will be additional pressure to reduce costs. Failing this, the crude efficiency gains may be smaller than has been observed in the past.
- Expanding activity and better recording of activity have been important determinants of the reduction in reference costs (defined in Appendix C) in all of the acute trusts in the research sample. Their experience relates to a period of general expansion in the NHS. Looking ahead, the emphasis will be on cash-releasing savings.
- The weight of cross-sectional and longitudinal evidence from the US suggests that quality of care in hospitals is positively associated with efficiency. This may be due partly to a direct association – involving ‘getting things right first time’ – and partly to indirect associations involving variations in management effectiveness and in the speed of adoption of new technologies across hospitals.
- The present research found strong and consistent support among executives in the study sites for avoidance of harm and ‘getting things right first time’. All of the trusts in the study had invested in quality and safety initiatives.
- Reducing average length of stay and raising day case rates have added greatly to acute hospital efficiency in the past. However, the acute length of stay in the UK appears to remain well above the OECD average – perhaps because of a relative lack of intermediate and long-term care.
- Past efficiency gains in the HCHS have been associated with bed reductions and hospital consolidation and closures. All of the ‘turnaround’ trusts that this study examined had reduced bed numbers.
- Closing whole sites is the best way to save costs, but hospital closures are unpopular and they raise complex trade-offs.
- Although the literature on the gains from hospital mergers is mixed, it has been suggested that significant efficiency improvements could be made if NHS organisations were to cooperate in the provision of back office functions.



## 7. Optimising the use of staff and improving staff productivity

Optimising the use of staff and controlling waste in staffing are critical issues both for hospital efficiency and for overall cost control, because staff costs represent 65–70 per cent of total hospital expenditure (NHS Employers, 2009). Recently, the National Audit Office (2010) has identified a failure to control staff costs effectively in some hospitals. This chapter addresses the question of finding the right levels and mix of staff. It goes on to consider improving staff productivity by controlling waste in staffing. A final section considers the question of sickness absence.

### Optimising the use of staff

Contractions in the NHS workforce have been associated with rising crude productivity (that is, lacking adjustment for any quality changes), and expansions have been associated with falling crude productivity in recent years. For example, total nurse numbers fell by about 10 per cent in the UK during the period of Hospital and Community Health Services (HCHS) crude efficiency gains in England in the 1990s, reported in Chapter 2 (Office of Health Economics, 2008). There were also steep falls in the employment of domestic and ancillary workers, although many of those displaced may have been re-employed indirectly in hospitals via NHS contracts with private cleaning, catering and laundry companies. Conversely, nurse numbers rose by 12.5 per cent between 2001 and 2005 during the recent period of falling hospital productivity (this time, quality-adjusted) in the HCHS (Office of Health Economics, 2008).

Of course, staff reductions can have unwanted consequences and can go too far. In the case of nurses, as mentioned previously, there is literature which suggests, on the basis of observational studies, that there are positive associations between various indicators of patient quality and aspects of the nurse working environment, a richer nursing skill-mix and higher nurse staffing levels.

Meanwhile, lower nurse staffing levels are associated with higher nurse dissatisfaction with their jobs, higher burnout and higher turnover. This literature has been reviewed by the US Association for Health Care Research and Quality (Kane and others, 2007). The Association's review concludes that higher registered nurse staffing is associated with less hospital-related mortality, inpatient cardiac arrest, hospital-acquired pneumonia and other adverse events. Limited evidence suggests that a richer nurse skill-mix is also associated with lower mortality. More overtime hours are associated with an increase in mortality and other adverse events. However, the review was unable to conclude that these associations are necessarily causal. It is possible that the associations are indirect: both nurse staffing characteristics and patient outcomes might be attributable, for example, to variations in the management and quality culture across hospitals. An English study on variations in nurse staffing levels (Rafferty, 2006) contains very similar findings to those gathered in the US.

In a rare attempt to explore the implications of such findings for efficiency, Needleman and others (2006) estimated some of the costs and benefits of improving nurse staffing in the US (making the assumption that the associations are causal). Needleman and colleagues base their calculations on an earlier study of the outcomes of variations in nurse staffing in 799 US acute hospitals. They estimate that increasing the proportion of registered nurses to total nurses in hospitals below the 75th percentile hospital to the proportion in the 75th percentile hospital, would cost \$811 million but would more than pay for itself in terms of avoided days of stay and avoided adverse events such as hospital-acquired infections. There would be a net reduction in costs of \$1,821 million or \$242 million, depending on whether fixed costs were recovered or not. In addition, there would be a reduction of about 5,000 deaths. Increasing nurse staffing hours per patient day (without changing skill-mix) to the 75th percentile level would not pay for itself, but would avoid 1,801 deaths. The cost per avoided death would compare favourably with the value of a statistical life used by federal agencies in the US. Assuming that the associations between nurse staffing and outcomes are causal, these findings would suggest that there is a clear business case for many US hospitals to improve nursing skill-mix, but not necessarily for increasing nursing levels. This contradicts what often appears to be the conventional wisdom – that diluting skill-mix would improve efficiency.



### Increasing staff/patient ratios has a positive effect on outcomes ... but adds to costs

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Valdmanis and others (2008) estimated efficiency variations across 1,377 US hospitals in 2004, using frontier analysis and including quality measures in their study. They concluded, among other things, that high-quality hospitals tended to have too many labour inputs (slack in the number of staff) and that low-quality hospitals tended to have too few labour inputs. Clearly, there is a trade-off: increasing staff/patient ratios has a positive effect on outcomes, subject to diminishing returns, but adds to costs. However, the current literature does not permit the identification of optimal levels of staff inputs (Kane and others, 2007; Newbold, 2008).

A rare and interesting longitudinal US study (Jiang and others, 2006a) examined changes in nurse staffing, among other things, in relation to changes in the quality and cost performance of 934 US hospitals between 1997 and 2001, following the Balanced Budget Act of 1997 (see Box 7.1). The findings of this study suggest that the adjustments that hospitals made to improve performance following the Act's squeeze depended as much on their initial conditions as on the external pressures that they faced. Cost-containment strategies were helpful to those hospitals which started out with high costs. Revenue-enhancing strategies were helpful to those hospitals with high mortality. Optimising nurse numbers seemed to be critical for achieving the highest performance. The findings also suggest that performance can be changed by organisational and managerial initiative, independently of external incentives.

**Box 7.1: Factors associated with longitudinal improvements in efficiency in US hospitals**

An American longitudinal study (Jiang and others, 2006a) examined the determinants of both sustained high performance and improved performance among 934 US acute hospitals between 1997 and 2001 following the Balanced Budget Act of 1997, which restricted federal payments to hospitals under Medicare.

The authors were able to categorise the hospitals into four different performance groups in each of the two years: high-quality/low-cost (highest performance); high-quality/high-cost; low-quality/low-cost; and low-quality/high-cost (lowest performance) – where quality was measured by risk-adjusted mortality for six medical conditions and four surgical procedures, and cost was measured by adjusted cost per discharge.

About half of the hospitals changed category over the period, and about 11 per cent moved from other quadrants to the highest performing group. The hospitals that stayed in the highest performance group over the period tended to be characterised by for-profit status and system membership. They were characterised also by relatively low nurse staffing ratios and higher discharges per bed – presumably an indicator of shorter length of stay.

The hospitals which moved from the high-quality/high-cost group to the highest performance group were characterised by operating in markets with high levels of competition. They were characterised also by reductions in nurse staffing, dilution of nurse skill-mix and reductions in high technology procedures – presumably all indicators of cost-containment strategies.

The hospitals which moved from the low-quality/low-cost group to the highest performance group were not associated with any external characteristics, but were characterised internally by increases in patient volumes, higher discharges per bed and increases in nurse staffing. Here, perhaps some of the extra nurses were needed to raise volume and some were used to raise quality.

The hospitals which moved from the lowest performance group to the highest performance group were not associated with any external characteristics and did not change nurse staffing significantly, but there were signs that they increased day surgery and high technology procedures – both likely to be revenue-enhancing.

These findings suggest that optimising nurse numbers is critical for achieving the highest performance. The findings also suggest that performance can be changed by organisational and managerial initiative, independently of external incentives.

The authors suggest that further work is required to identify the key organisational and management strategies which have led to success.

Positive associations can be found between levels of doctors' staffing and patient outcomes. For example, Pronovost and others (2002) conducted a literature review of studies of doctors' staffing variations across intensive care units. They concluded that high-intensity medical staffing was associated with lower intensive care unit and hospital mortality, and with reduced intensive care unit and hospital length of stay. In England, Jarman and others (1999) reported that variations in standardised mortality across hospitals are significantly and negatively associated with hospital doctors per bed, and with GPs per head of population in the areas from which hospital patients are drawn, after controlling for other variables. However, such findings – like those with nurses – are not sufficient to identify the most efficient levels of doctors' staffing, given that additional medical staffing comes at a high cost and is certainly subject to diminishing returns. The precise trade-offs remain unclear.

Given that most, if not all, hospital care depends on teamwork, this leads to wider questions about hospital staff skill-mix generally. Of course, there is literature suggesting that nurses can be substituted successfully for doctors in some circumstances, but most of this literature appears to relate to primary care. A review of nurses in advanced practice roles across all types of setting has suggested that whereas there is evidence that nurses can provide care that is technically equivalent to doctors in various settings, and sometimes greater patient satisfaction, little or no evidence is available on the cost-effectiveness of these arrangements (Buchan and Calman, 2005). A review of studies of the use of nurse practitioners in hospital emergency departments suggested that nurse practitioners were neither better nor worse than house officers in treating minor injuries (Dealy, 2001).



Positive associations can be found between levels of doctors' staffing and patient outcomes

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### Improving productivity

Staff productivity can be improved by reducing spare labour capacity and, often, the use of agency staff and overtime. An obvious way to identify spare capacity is to use a benchmarking approach.

A relevant American publication entitled *Superior Productivity in Health Care Organisations: How to get it, how to keep it* (Fogel, 2004; see Box 7.2) focuses almost exclusively on identifying and reducing spare capacity among staff using benchmarking. It also includes a management strategy to bring about such change (the latter echoes some of the findings in Chapter 4).

**Box 7.2: Improving labour productivity in US hospitals**

An American author, Paul Fogel, has suggested ways in which labour productivity in hospitals might be improved (Fogel, 2004). His book starts from the observation that in many US hospitals, revenues are not keeping pace with expenses. This makes it essential to obtain tighter control over the largest single cost – labour.

Fogel suggests that there are some strategies that do not work, including over-complex measurement and reporting systems and lack of management authority and accountability at the right level for hiring and firing decisions. He suggests that diluting skill-mix is often ineffective, partly due to loss of labour flexibility. He identifies the use of agency staff and overtime as major sources of excess labour costs.

His approach to improving hospital productivity can be broken down into three main elements. First, it is necessary for each hospital's senior management to develop a written productivity policy incorporating sound labour standards. The standards should be derived from historical benchmarking of labour productivity over the past three years or so, in each hospital department.

Second, he suggests negotiating agreement with departmental managers over productivity goals based on historical benchmarks, delegating authority to those managers for meeting these goals, and holding them to account with the help of intensive productivity monitoring.

Third, Fogel suggests a set of incentives and consequences for the managers. Management compensation should be strongly linked to cost saving, and persistently incompetent managers should be encouraged or required to depart. Also, managers should be encouraged to aim higher than the relatively cautious benchmarks outlined above.

There may well be a need for monitoring of quality of services to avoid productivity being obtained at the cost of quality, but Fogel is quite unspecific about how this should be done.

The book includes a chapter on the politics of productivity. There is a section on medical staff, which suggests that collaboration between doctors and managers is vital for improving departmental productivity. There is a section on unions, which suggests that improving productivity can offer a win-win opportunity because higher productivity can avert lay-offs. There is a section on executives, who may oppose the delegation of hiring and firing authority to managers. Finally, there is a section on managers, who may resist their new responsibilities.

In England, staff productivity issues were identified by the NHS Institute for Innovation and Improvement (2006) among its nine areas with potential for efficiency and productivity improvements in hospitals. Two of the areas highlighted in 2006 concerned improving staff productivity and managing staff and recruitment costs, respectively. The first of these areas identified variations in the apparent crude productivity of consultant medical staff, presumably building on the work of Bloor and Maynard (2007), which revealed wide variations in activity per medical consultant across hospitals in England.

### Box 7.3: Improving staff productivity

Inevitably, staff costs are the first area that trusts look to for efficiency savings. All six of the trusts the present study visited had reduced staff numbers significantly in recent years. As well as reducing costs, it was about ensuring that the organisation had staff with the right skill set to drive productivity and to offload 'deadwood' (that is, underperforming staff). David Loughton, Chief Executive of The Royal Wolverhampton Hospitals NHS Trust, says:

*There is no question about relieving deadwood, especially when trying to take money out of the system. You cannot motivate staff if there are people in the way who don't perform and you don't do anything about it.*

For most of the sites, staff reductions were achieved through natural wastage, freezing vacancies, early retirement and some voluntary redundancies, with very few mandatory redundancies. Staff turnover at most NHS trusts in England was typically between 10 and 20 per cent in 2008 (NHS Information Centre, 2010), and executives were in agreement that compulsory redundancies were rarely necessary.

In contrast, Sandwell and West Birmingham Hospitals NHS Trust adopted a deliberate policy not to impose a blanket vacancy freeze, out of concern that losing a random set of staff would have a detrimental impact on services. Instead they maintained a limited recruitment programme alongside a programme of redundancies. "You can address it through natural wastage, but the wrong jobs go. We found that overall performance improved during this period," remarks Chief Executive, John Adler. Natural wastage still played a part and the number of redundancies was much lower than expected. Staffing levels have since drifted up and the Trust envisages losing 300 posts during 2010/11.

Skill-mix review has been a feature of all six trusts, although there was considerable uncertainty over whether to increase or decrease the ratio of qualified to unqualified staff, particularly around nursing. This echoes limitations in the literature around the optimal level and mix of nursing staff in hospitals.

The Royal Wolverhampton Hospitals NHS Trust had succeeded in removing £2 million of costs through a skill-mix review, which resulted in half of wards gaining staff and more than 100 nurse vacancies being filled. The end result was a ratio of 70 qualified nursing staff to 30 unqualified for most areas of the trust.

Another way in which the six trusts had reduced their head count was by limiting, or stopping altogether, the use of agency staff, and giving preference to in-house banks instead. An interesting observation was that internal bank staff, unlike agency staff, would be familiar with the hospital's quality culture. In addition, many of the trusts had worked to reduce their sickness absence rates. NHS staff are absent for 10.7 days each year on average, and more than 45,000 NHS workers call in sick every day, according to NHS Employers (2009).

Robert White, Finance Director at Sandwell and West Birmingham Hospitals NHS Trust, advocates better medium-term planning of the clinical workforce in particular:

*I'd like to see departments think creatively about whether they will need to replace people and to start thinking about it now. That thinking needs to be ready to pull off the shelf, rather than leaving it until someone leaves.*

The need to reduce staff costs and raise staff productivity may be precipitated by a crisis. The NHS found itself with a financial crisis in 2004/05 when more than one-quarter of NHS organisations had fallen into significant financial deficit. In response, the Department of Health introduced a 'turnaround' programme, targeted on the



organisations with the largest deficits. Articles in the *Health Service Journal* (2007; Dent and Creamer, 2007; Mooney and others, 2007; Vaughan and others, 2007; Vize, 2007) report that one 'turnaround' trust had reduced posts by about 10 per cent over two years – mainly by natural wastage. A popular tactic was for senior management to take control of the filling of vacancies for a period, sometimes requiring sign-off by the chief executive. Another popular tactic was to reduce the use of agency and locum staff, often by strengthening internal bank arrangements or appointing more permanent staff selectively. NHS Employers recommends making the most of natural wastage.

### Sickness absence

The subject of staff sickness absence in the NHS was visited by the Boorman Review in 2008/09 (Department of Health, 2009b; 2009c). The NHS has higher rates of staff sickness than other parts of the public sector. A review of the relevant literature (Hassan and others, 2009) suggested that although good evaluations are lacking, there is evidence that in a number of industries several types of workplace interventions for a variety of conditions are effective in improving the health and wellbeing of staff. In addition, in the case of health care and social services, there is moderate evidence that ergonomic and other prevention programmes for musculoskeletal diseases are worth undertaking on economic grounds. Similarly, there is moderate to limited evidence that occupational disease prevention interventions can have positive financial implications. The Boorman Review made a number of recommendations, which were swiftly accepted by the then Secretary of State for Health, for more investment in occupational health services for NHS staff centred on prevention and early intervention. Based on previous experience at Royal Mail and British Telecom, it was assumed that current rates of sickness absence in the NHS could be reduced by one-third, adding the equivalent of 14,900 whole-time equivalent staff and saving the NHS £555 million a year. Improvements in patient satisfaction and outcomes, and reductions in the use of agency staff and staff turnover, could be anticipated (Department of Health, 2009b).



## Key points

- Staff productivity is critical for the efficiency of hospitals, because staff costs account for 65–70 per cent of total costs. There is aggregate evidence from the UK to suggest that contractions in staff numbers have been associated with rising crude productivity in hospital services, whereas expansions have been associated with falling productivity.
- Whereas cutting staff will save costs and is likely to raise crude productivity, there is strong (observational) evidence both from England and the US to suggest that patient outcomes can be harmed by reducing nurse/patient ratios and diluting nurse skill-mix. There is similar evidence linking outcomes and doctor numbers. In the US it seems that a richer nurse skill-mix would improve efficiency in many hospitals. The present research in England revealed uncertainty over the right skill-mix in hospitals.
- One longitudinal study in the US suggests that following a price squeeze, hospitals that improved their performance, having started with high-quality care and high costs, did so partly by reducing nurse numbers and diluting skill-mix. Hospitals that improved their performance, having started with low quality and low costs, did so partly by increasing nurse numbers.
- There may be opportunities to cut out waste in staff costs by benchmarking departmental staff productivity (while not neglecting quality or outcomes).
- There is evidence to suggest that often, staff productivity in hospitals can be raised by reductions in the use of agency staff and overtime, and that improving occupational health services for NHS staff may be cost-effective.
- Similarly, the present research identified that ‘turnaround’ was generally associated with reductions in posts, offloading underperforming staff, reductions in sickness absence and replacing agency staff with internal bank staff.
- Management practice varied between those trusts which made almost all staff reductions through natural wastage – partly for morale reasons and partly to save redundancy costs – and those that made significant numbers of redundancies with a view to reducing only unwanted jobs.

## 8. Drawing together the lessons

### Requirement to improve productivity during a major NHS reorganisation

This report has examined the extent to which past efforts to improve productive efficiency in the NHS and some health systems overseas can speak to the situation now facing the NHS. More particularly, it has addressed the requirement to find savings of up to £20 billion from efficiency improvements in the NHS over the next four years – savings which, it is planned, will be recycled back into the NHS within an overall budget that will remain flat in real terms. The project has focused on hospitals because they account for the bulk of health spending, they have been the locus for most of the apparent deterioration of productivity in the NHS in recent years, and they are the focus of government plans to release resources for the NHS.

It should be noted that the situation now facing the NHS has changed in one important respect since this project was started at the end of 2009. The Coalition Government formed in May 2010 has announced a major reorganisation of the NHS, which will affect hospitals both directly and indirectly (Department of Health, 2010b).

### Scale of the challenge to make savings

Insofar as the continued requirement to save up to £20 billion is concerned, it may be worth putting this challenge into a wider context. Several countries have cut real spending on health care over a number of years during the past few decades. For example, Finland reduced real spending on its NHS-style health system by about 15 per cent between 1991 and 1995, following an economic crisis (OECD, 2005). There was no recycling of the savings – they were lost to the system. As mentioned previously, crude efficiency in a sample of Finnish hospitals increased by between 3 and 5 per cent a year between 1988 and 1994 (Linna, 1998). Half of the improvement was due to continuing technical advances and half was due to gains in cost-efficiency. There were also large gains in crude productivity in primary care health centres. A full account of the impact on outcomes in Finland is not available, but there was no discernible change in the rate of downward decline in mortality from diseases of the circulatory system during or after the contraction (OECD, 2005).

During this project the authors have attempted to identify literature which might indicate what magnitude of cash savings could be available from specified productive efficiency initiatives. Very little literature was found that would make this possible. However, during the project the Department of Health published estimates, prepared by McKinsey & Company, of potential efficiency savings in the NHS (Department of Health, 2009d). Summarising a wealth of detailed estimates, many involving proposed reductions in variations in productivity identified with the help of benchmarking, McKinsey suggests that savings of between £13 and £20 billion were potentially available in the NHS as a whole over the following three to five years. About 45 per cent could come from improvements in technical efficiency, about 35 per cent from improvements in allocative efficiency and about 20 per cent from a shift of

hospital care to the community. McKinsey also put forward suggestions about how such changes could be brought about – mainly by a top-down, managed process for reducing variations throughout the NHS, improving procurement and removing national barriers to change.

## Focusing on the determinants of efficiency

The ground covered in this project is somewhat different from and may be seen as complementary to the McKinsey report. The present study has focused on evidence in the literature about the determinants and sources of productive efficiency in hospitals, looking at (as depicted in Figure 2.1):

- the external environment
- management and the adoption of technology
- changes to hospital processes.

In addition, it has sought to find out from some NHS trusts which appear to have improved their efficiency in recent years, how they did it. The authors have not looked at allocative efficiency, or centralised or localised decisions on the pricing of inputs.

## The external environment

The authors' examination of the external determinants of productivity suggests that certain features of the external environment for hospitals in England will favour the prospects for hospital productivity gains in the next few years. First, given the forthcoming financial squeeze, it bodes well that in the past, increased financial pressure in the NHS has been strongly associated with increases in crude hospital productivity – although these have relied mainly on increases in activity, which could be suppressed on this occasion. Second, going by past experience, some of the new medical technologies now heading towards the NHS are likely to offer potential cost savings as well as productivity improvements – with the help of advice from the National Institute for Health and Clinical Excellence (NICE). Third, the institutions of the internal market and case-based funding seem to be favourably associated with productivity, and may continue to help to give English hospitals their apparent productivity edge over those in Scotland. However, the evidence on other factors, such as external performance management and pay-for-performance, is mixed.

## Management and the adoption of new technology

This study suggests that what happens in the management environment will be absolutely critical if hospitals are to provide the lion's share of up to £20 billion savings over the next four years. Good leadership, certain management practices and staff engagement appear to be associated with high hospital productivity. Here, the research suggested that turnaround was often associated with changes. Manager–clinician cooperation is particularly important. The right nurse management and degree qualifications seem to protect quality of care when there are reductions in nurse/patient ratios (although it is not possible to be sure of the causality here). Among management techniques, the research yielded favourable reports on service-line reporting, Lean production and cost-improvement programmes.

In addition, the rate of adoption of new technologies will be critical. There is evidence for some low-cost hospital technologies that diffusion rates vary widely, and that outcomes can be higher and costs can be lower where diffusion is faster. There is also evidence that affordable new technologies continue to be adopted, even under stringent financial restrictions. The research revealed a belief among many NHS managers that ‘necessity will be the mother of invention’.

## Changes to hospital processes

Changing hospital processes lie at the heart of the productivity question. Past improvements in crude hospital productivity during budgetary contractions have been associated with increased activity. If activity increases are restrained during the forthcoming contraction, productivity improvements may be less than they have been in the past. Put another way, the government’s plan to restrain hospital activity growth at the same time as requiring cost savings from productivity gains sets NHS hospitals an unusually severe challenge. There is significant evidence of a positive association between high quality and low costs, but this may be less of a direct association and more the result of differences in management culture and technology adoption across hospitals. Increasing day cases and reducing length of stay have been potent sources of efficiency increase in the past. Acute hospital length of stay seems to be relatively high in the UK compared with other OECD countries, but social service cuts may inhibit the scope for reduction. Bed closures could save costs, but full savings would require closing whole sites. PFI commitments may help determine which sites, if any, should be closed. The research suggested that many managers believe that investing in quality can save costs. Also, there was much support for further steps to increase day cases and reduce length of stay, and for making consequential reductions in bed capacity.

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“ The government’s plan to restrain hospital activity growth at the same time as requiring cost savings from productivity gains sets NHS hospitals an unusually severe challenge

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Much will depend on increasing labour productivity in hospitals. Cutting staff numbers is an obvious source of savings, but studies of nurses’ and doctors’ productivity suggest that it is easy to harm quality of care. As indicated previously, good nurse management and a rich skill-mix may protect quality in such circumstances. The current literature does not permit the identification of optimal levels of staff inputs. Both the literature review and the fieldwork suggested that reducing agency staff and sickness absence were often appropriate ways to reduce labour costs without harming quality. There were differences in views among the interviewees as to whether it is better in terms of balancing potential redundancy costs against potential productivity and motivational gains to achieve staff reductions by natural wastage, or by making selected redundancies.

## Need for further work

Many of the topics identified in this review require further investigation. One particular puzzle is to understand better how internal and external performance management can be used best to promote efficiency in organisations staffed largely by health professionals. The (so far, slender) evidence on internal performance management within hospitals (as within firms) is positive, but the evidence on external, top-down performance management appears to be somewhat mixed. Where does that leave 'top-down', external performance management in the NHS? Is compiling NHS-wide information for confidential, peer-group benchmarking helpful for efficiency? Is publishing that information helpful? Is setting top-down targets and incentives for managers on the basis of that information also helpful? What about adverse side-effects and unintended consequences? Further work is required to answer these questions more firmly.

## Some brief policy conclusions

Returning to the situation now facing the NHS, the findings of this study suggest that the quality, innovation and productivity parts of the Department of Health's QIPP agenda provide a conceptually sound basis for approaching efficiency improvements in English hospitals in the next four years – especially in the proposal to recycle some of the productivity savings into new technological advances. Moreover, the financial and regulatory measures set out in the last two operating frameworks for the NHS seem to provide practical incentives for productivity improvements, particularly in the way that they put financial pressure on hospitals.

However, the findings also suggest that the planned, major reform of the NHS could detract from that agenda. First, the reorganisation is likely to distract PCTs and GPs from pursuing the shift of some hospital care into the community. Ironically, any failure to restrain the growth of hospital activity may make it easier for hospitals to improve crude productivity, but it will reduce their incentive and ability to save costs without harming quality. Second, given that one of the strongest findings of this study is that good leadership and good general and clinical management are crucial for making productivity gains, it is surely a worry that the reorganisation risks distracting managers from the efficiency agenda. In the long term the hope must be that the reorganisation is a friend to QIPP, but in the short term it looks like an enemy.

# Appendix A: Research methods

## Literature review

The literature review was designed to cover medical, public health, nursing, health services research, health management and economics sources from 1988 to 2010. English-language literature on health system and hospital efficiency in Australia, Canada, Scandinavia, the Netherlands, the UK and the US was accessed. The databases which were accessed included Cinahl, EconLit, Embase, HMIC, Medline and PubMed.

The review focused initially on the following keywords: cost-efficiency; cost and quality; efficiency; efficiency and effectiveness; efficiency and quality; health care; health services; health system; hospitals; labour productivity; Magnet hospitals; manager–doctor cooperation; manager–doctor relationships; nurse burnout; nurse productivity; performance; primary care; productive efficiency; productivity; skill-mix; staff productivity; technical efficiency; turnaround; value for money; and x-inefficiency.

The initial search was carried out by the staff at the Health Services Management Centre Library in Birmingham and by Dr Benedict Rumbold at the Nuffield Trust.

## Fieldwork methodology

The fieldwork involved conducting interviews with executive managers and clinicians at four acute and two mental health trusts in England:

- Barnet and Chase Farm Hospitals NHS Trust
- Mersey Care NHS Trust
- North East London NHS Foundation Trust
- Sandwell and West Birmingham Hospitals NHS Trust
- St Helens & Knowsley Teaching Hospitals NHS Trust
- The Royal Wolverhampton Hospitals NHS Trust.

These trusts were selected for the lessons that they could offer, having apparently increased their productive efficiency according to certain criteria set out below. Each trust was visited during January and February 2010. Each visit comprised face-to-face interviews with at least the chief executive, finance director, medical director and nursing director. A small number of interviews were conducted over the telephone.

Mindful that any examination of productive efficiency needs to consider the wider system, the authors also interviewed senior executives at the PCTs that commissioned the greatest proportion of activity from each of the six trusts. The aim of this study was to understand the wider impact of interventions by these trusts to increase their efficiency on PCTs and community services. Interviews were conducted over the

telephone with seven PCTs in total (two PCTs commissioned an almost equal share of activity from one trust).

In total, 36 senior NHS executive managers and clinicians were interviewed, as well as experts in organisational turnaround. (A list of all those interviewed is contained in Appendix B.)

#### How the trusts were selected

The four acute hospital trusts and two mental health trusts that participated in this project were selected in three stages.

- Stage 1 – The Annual Health Check scores were used to identify acute and mental health trusts that had improved their scores for quality of financial management over the previous three years (2006/07 to 2008/09) and had sustained scores of ‘good’ or ‘excellent’ for quality of services.
- Stage 2 – The Reference Costs Index for each of the shortlisted trusts was examined. At the time of sampling, the latest reference costs available were for 2007/08. The most recent Index (2008/09) indicates that reference costs for two of the acute trusts included in the project have risen. For mental health trusts, greater weight was given to the Index than to the Care Quality Commission scores, as they generally had good scores for quality of financial management during the previous three years, making it harder to identify trusts that had experienced a shift in performance.
- Stage 3 – The annual reports from 2006/07 for each of the shortlisted trusts were reviewed in order to understand the financial position of each trust, as well as some performance data. The annual reports proved to be a mine of useful intelligence.

#### Highs and lows: about the study sites

Some of the six trusts that participated in this project have a troubled history, for example because they had the unhappy distinction of receiving the first regulatory Hygiene Code Improvement Notice, a damning regulatory report, or had their board removed as a result of poor performance or inefficiency. Two were officially designated as being in turnaround, and a third was one of the 17 most financially challenged trusts in the country. For the rest, the language of turnaround was often used to describe the process that they had been through to achieve financial balance.

These are also trusts with a strong track record of delivering cost improvement programmes. The six trusts all succeeded in achieving financial balance within a couple of years. For some, this was not without significant financial support from local PCTs and the strategic health authority. However, it also reflects a strong emphasis on cost improvement, combined with increases in activity and service improvements, and success against independent regulatory measures – four out of the six trusts are among those ‘named and famed’ by the Care Quality Commission as high performing.



## Appendix B: List of interviewees

John Adler, Chief Executive, Sandwell and West Birmingham Hospitals NHS Trust
Robert Bacon, Chief Executive, Sandwell PCT
Nigel Beverley, Chief Executive, NHS Enfield
Alison Blair, Deputy Chief Executive, NHS Barnet
Les Borrett, Director of Finance, North East London NHS Foundation Trust
John Brouder, Chief Executive, North East London NHS Foundation Trust
David Carter, Director of Finance, Barnet and Chase Farm Hospitals NHS Trust
Gill Core, Director of Nursing, Midwifery and Governance, St Helens & Knowsley Teaching Hospitals NHS Trust
Jon Crockett, Chief Executive, Wolverhampton City PCT
Stephanie Dawe, Chief Operating Officer and Chief Nurse, North East London NHS Foundation Trust
Averil Dongworth, Chief Executive, Barnet and Chase Farm Hospitals NHS Trust
Nigel Edwards, Director of Policy and Communications, The NHS Confederation
Cheryl Etches, Director of Nursing and Midwifery, The Royal Wolverhampton Hospitals NHS Trust
David Fearnley, Medical Director and Deputy Chief Executive, Mersey Care NHS Trust
Jan Filochowski, Chief Executive, West Hertfordshire Hospitals NHS Trust
Damien Finn, Director of Finance, Information and Commercial Services, St Helens & Knowsley Teaching Hospitals NHS Trust
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Alan Yates, Chief Executive, Mersey Care NHS Trust

# Appendix C: Concepts and measurement of efficiency

## Concepts of efficiency

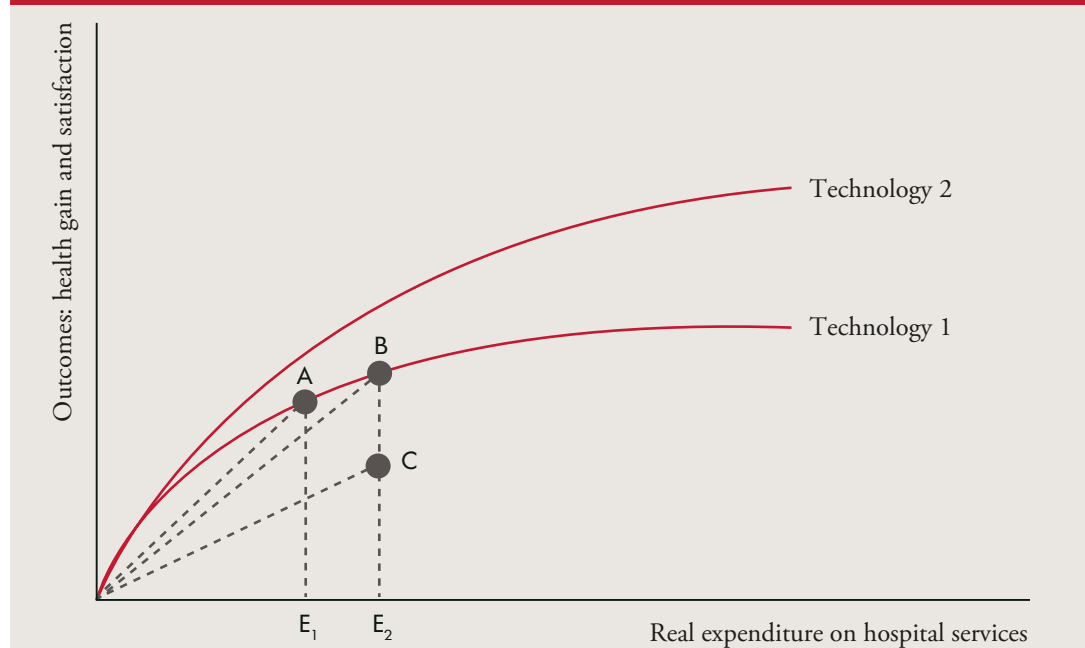
Economists distinguish between three separate concepts of efficiency:

1. Technical efficiency – minimising the use of any one input to produce a given output or outcome, given the level of other inputs.
2. Cost-efficiency – choosing the least-cost mix of inputs to produce any one output or outcome).
3. Allocative efficiency – choosing the mix of outputs or outcomes which maximises benefits.

Note that if outcomes are specified as the endpoint of production, ‘effectiveness’ is subsumed in ‘efficiency’. Sometimes, technical and cost-efficiency together are called ‘productive’ efficiency – which, if outcomes are specified as the endpoint of production, is identical to ‘cost-effectiveness’. These two terms are used interchangeably in this report.

At the heart of the idea of productive efficiency is the concept of a production function or frontier – the relationship between real output and real inputs which maximises the output that can be achieved for given inputs. This is defined for a given state of technology (Figure C.1).

Figure C.1: Productive efficiency of hospital services for a given population



This figure allows us to distinguish three broad sources of efficiency.

1. Returns to scale can be illustrated by the move from point A to point B on the production function/frontier labelled ‘Technology 1’. Hospital spending increases from E1 to E2 and production of outcomes remains on the function/frontier. However, there are diminishing returns to scale and average productive efficiency declines (represented by the slope of a line from the origin to points A and B, respectively). This is associated with the idea of ‘flat-of-the-curve medicine’.
2. Pure productive inefficiency can be illustrated by point C, where outcome falls short of that achieved at point B, despite an identical level of hospital spending, E2. Consequently, average productivity is lower at C than at B. This is associated with the idea that efficiency can be improved by reducing waste or slack.
3. Technological advance can be illustrated with the upper curve, labelled ‘Technology 2’. If technological advance (either clinical or organisational) allows for higher outcomes at any given level of real hospital spending, then there will be higher potential efficiency at all three points, A, B and C.

### Measurement of efficiency

It is possible to measure the efficiency of productive units using ‘engineering’ principles: that is, by specifying the maximum ratio of, say, an output or outcome to be produced by a mix of inputs according to some technical standard, and by comparing the observed efficiency of units against that standard. However, it is more usual to measure efficiency by a form of benchmarking among a group of existing productive units. Those with the highest observed ratio of output to inputs are taken as defining the efficiency ‘frontier’, and the observed inefficiency of the remaining units is defined in relation to this. In statistical studies of samples of hospitals, it is typical to find average levels of inefficiency of between 10 per cent and 20 per cent. Note that it is unlikely that benchmarking will identify any perfectly efficient units, so that such a process of benchmarking will define an *empirical* frontier, which is likely to lie below or within any *theoretical* frontier.

Two statistical methods for defining the efficiency frontier for a sample of productive entities, for which output, input and/or unit cost data are available, are data envelopment analysis (DEA) and stochastic frontier analysis (SFA). Together these are referred to as ‘frontier’ techniques. DEA utilises linear programming to define the frontier. It has the advantage that it can handle multiple outputs (including quality, if data are available) and multiple inputs. However, it is a deterministic technique which does not allow for random statistical variations, and it can be influenced by extreme values which are the result of measurement error. SFA is used to define efficient cost functions and allows for random variation in the dataset. If longitudinal data are available, it is possible to use a form of DEA analysis to decompose efficiency variations over time into those which are due to pure technical efficiency, those which are due to returns to scale and those which are due to technological advance using the so-called ‘Malmquist Index’ (see Maniadakis and others, 1999).

The measurement of efficiency in health care is impeded everywhere by the difficulty of measuring *quality* of care – both clinical quality and patient experience or satisfaction – although the situation is improving. The authors have been guided by the concepts set out by Donabedian (1966) in using the term ‘quality’ in this report: that is to say,

quality can be measured with varying degrees of success by structure, process and outcome variables. The measurement of efficiency is also impeded by the difficulty of measuring patient severity, including the effect of comorbidities. Studies which exclude quality and/or *severity* risk attributing variation in these variables to variations in efficiency. In an analysis of more than 4,000 US hospitals, Zuckerman and others (1994) found that including measures of patient severity in the estimation process reduced the average estimate of inefficiency from about 19 per cent to about 13 per cent. Adding a set of measures of quality had little further effect on the estimates. For a sample of 195 US hospitals for which individual patient severity data were available, Rosko and Chilingerian (1999) were able to show that whereas adjusting output for diagnosis-related group (DRG) case mix reduced estimated inefficiency by 50 per cent, there was little additional effect from using the patient severity data. However, in an analysis of 1,290 American hospitals, Mutter and others (2008) found that inefficiency estimates were affected significantly by allowing for patient comorbidities in addition to DRG case mix adjustment: mean inefficiency was reduced from about 17 per cent to 14 per cent. There was little additional effect from allowing for an outcome measure of quality (risk-adjusted mortality) in addition to a structural measure of quality (hospital teaching status).

A significant proportion of the studies reviewed in this report exclude quality measurement altogether: that is to say, output is measured by activity only. However, most adjust for patient severity by some form of DRG case mix. In addition, a growing number of efficiency studies include some clinical quality measures, although few include patient experience or satisfaction. Measures of productive efficiency which exclude quality are referred to as 'crude productivity' in this report.

#### Box C.1: The challenge of measuring an NHS trust's efficiency

It is difficult to compile a set of statistics that reliably demonstrate a trust's productivity and efficiency. In trying to pinpoint NHS hospitals with quantifiable changes in their efficiency, the authors confronted issues of multiple data sources, competing methodologies and data limitations.

- *Reference costs* are the average cost to the NHS of providing a defined service in a given financial year. However, a reduction in reference costs is not necessarily an indicator of increased efficiency. The lion's share of reductions in reference costs among the six trusts examined in this study was attributed to better recording of activities; the rest was explained by increased activity.
- *The Care Quality Commission's quality of financial management ratings* are an indicator of overall financial health, in its broadest sense. The ratings for neither foundation trusts nor NHS trusts can be considered measures of efficiency or productivity.
- *Trusts that have moved out of deficit* can be assumed to have become more efficient. However, the efficiency gain may have been small, and may have been achieved by judicious use of the extra income the NHS has received in recent years.

Capturing a reliable, independent assessment of quality of services can be equally troublesome. Confidence in the Care Quality Commission's assessment has been shaken by the exposure of poor standards at trusts with a good performance rating. Positive ratings for quality of services at Basildon and Thurrock University Hospitals NHS Foundation Trust, for example, sat uncomfortably next to a patient safety score of zero from Dr Foster (2009) and a Health and Safety Executive prosecution (Care Quality Commission, 2010). Meanwhile, following a national review, a new methodology has been devised for measuring hospital mortality – the Summary Hospital-level Mortality Indicator (Department of Health, 2010e).

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