National Audit Office

Department of Health

Management of NHS hospital productivity

Methodology

DECEMBER 2010

Methodology

1 This document provides a detailed description of the methodology we used for our report Management of NHS hospital productivity (HC 491, Session 2010-11). A summarised methodology is in Appendix One of that report, and a separate document giving further details on the analysis of hospital reference costs is available on our website (www.nao.org.uk/NHS-Productivity-2010).

2 The report evaluates how productivity in hospitals in England has changed over the last ten years, and the effectiveness of the Department's initiatives in driving productivity in hospitals. It also assesses how well placed the NHS is to deliver improvements in hospital productivity. Our report focuses on acute hospitals in England although in instances where data was not available at this level we present, as proxy measures, figures from: all hospitals (including community and mental health) in England, all UK hospitals (including Wales, Scotland and Northern Ireland), or for the wider category of Hospital and Community Health Services, HCHS (including all hospitals and ambulance services).

The main elements of our methodology are set out below:

Consultation with Strategic Health Authorities

3 We visited all ten Strategic Health Authorities (SHAs) between January and March 2010. The primary purpose of these visits was to understand the role of SHAs in improving hospital productivity, including the use of information to manage performance (including regional benchmarking), sharing and adoption of good practice, workforce productivity issues and performance management of the commissioning process. The visits involved interviews with key managers within the SHA that had a role in improving productivity for example, finance directors, medical director, and productivity leads.

4 We also reviewed Quality, Innovation, Productivity and Prevention (QIPP) plans in the Summer of 2010 to identify what efficiency savings have been identified; how the plans integrate national QIPP themes; and understand the how plans will be implemented.

Case study visits NHS hospital trusts

5 Between February and May 2010, we visited 12 NHS hospital trusts, selected to cover:

- those with above-average, average, and below-average reported efficiency;
- foundation and non-foundation trusts; and
- different geographical areas.

The visits were designed to inform our understanding of the levers and barriers trusts face when managing productivity, including use of information and performance management of clinical and medical staff. The case study visits involved semi-structured interviews with the Finance Director, Medical Director, Director of Workforce, and Director of Nursing.

6 This supplemented our ongoing evaluation of workforce issues, to identify the impact of our previous reports. This has involved interviews with key stakeholders including the British Medical Association and NHS Confederation; and auditing good practice examples.

A survey consultants in England

7 Hospital consultants were surveyed to obtain both views on mechanisms designed to improve productivity such as job planning, and quantitative data on consultant work patterns. The survey consisted of 17 questions and was administered electronically using Doctors.net.uk. The survey was run in May 2010, in total 500 responses were received of which 129 were excluded, leaving 381 valid responses. The reasons for exclusions were that the respondents did not hold a contract with the NHS (such as some academic or armed forces) or did not work in acute care specialties (for example, mental health). Given this response rate, the 95 per cent confidence interval for a dichotomous question (e.g. Yes/No) is at most +/- 5 per cent.

A survey of non-executive directors

8 A questionnaire was sent out, through the Appointments Commission, to all Chairs of NHS trusts in England. We received 48 responses to the survey which included 33 questions. The survey intended to obtain views on productivity in hospitals, including the use of information for business planning.

9 We supplemented this work with a review of a sample of board minutes from April 2009 to July 2010 to identify the information used to measure and manage productivity; and to identify how boards consider efficiency.

Consultation with key stakeholders

10 We conducted semi-structured interviews with the following experts and stakeholders:

- Department of Health.
- NHS Institute for Innovation and Improvement.
- Office for National Statistics.
- NHS Confederation.
- British Medical Association.
- Dr Andrew Goddard, Director of the Medical Workforce, Royal College of Physicians.
- Professor Alan Maynard, University of York.
- Professor Andrew Street, University of York.
- Professor Peter Smith, Imperial College, London.
- John Appleby, Kings Fund.

This consultation was designed to inform our understanding of the national initiatives designed to improve productivity in hospitals, and systemic levers open to the NHS to drive productivity improvement.

Analysis of the hospital Reference Cost Index, including multivariate regression analysis

11 We compared hospitals reported efficiency scores (reference cost index, RCI) to a range of organisational factors to identify the key drivers. Further details of this work are included in a separate online methodology (www.nao.org.uk/publications); however, some of the key considerations are included below.

12 The Reference Cost Index (RCI) is calculated to give a score of 100 to trusts that have been able to provide services at national average unit cost. Hospitals which have costs above the national average have a score above 100, whereas hospitals which are able to deliver care below the national average have values below 100. For example a hospital whose cost profile produced an RCI score of 83, would on average provide clinical services 17 per cent below the 'expected' cost had services been delivered at the national average.

13 While there are many drivers of costs of hospital care, the variation in RCI between hospitals indicates there are potential efficiency opportunities. Our regression analysis was intended to investigate the reasons for variations so as to help individual trusts assess where they could make savings. The index, however, is not a full measure of productivity and so any improvements must be made with full consideration to the effect on the quality and safety of patient care.

14 Note that the figures are subject to the following observations:

- It is implicitly assumed that the variables in the model actually cause changes in hospital efficiency, rather than simply being indicators of it. Whilst we believe this is a reasonable assumption, it is not something that could ever be proved with regression analysis.
- Our analysis resulted in a different data model for each year. Each of these models is an approximation of the 'true' underlying relationship between variables, and thus any potential cost savings calculated from them can only be rough estimates.
- It may be that certain factors are outside the control of hospitals. For example, whilst perhaps some improvement could be made by e.g. better management of long-term conditions, the percentage of emergency admissions may be something largely outside of a hospital's control.
- A change in one variable may cause changes in other variables. Therefore a potential total cost saving calculated simply by adding up the potential cost saving for each of the variables should be treated only as a broad estimate.
- There are known inaccuracies with some of the datasets which we have used in creating our models. The degree of error in these datasets is not high enough to warrant discarding them, but it does mean that any estimates are likely to contain a degree of error.

15 For all of these reasons, our estimated cost savings figures should be treated as broad estimates, rather than precise figures.

Detailed statistical analysis of financial and activity data in one hospital trust

16 This work was conducted on a large NHS trust hospital, and was intended to instruct our understanding of how information is used in hospitals to help improve productivity. We commissioned a detailed review of analysis of hospital-level performance data, using statistical process software, to identify drivers of variations and trends across acute specialities. The review looked specifically at lengths of stay, emergency admissions and readmission rates to identify trends across specialties and opportunities to improve productivity. We probed the trust on their understanding of this data and their management of performance and productivity.

Calculating national productivity index for hospitals

17 In August 2010, we asked the Office for National Statistics (ONS) to disaggregate the elements mainly attributable to hospital care from the existing measure for UK healthcare productivity. This productivity index is subject to the following observations:

- The figures are based on data for Hospital and Community Health Services (HCHS) which includes ambulance and non-acute hospital services (e.g. community and mental health). Acute hospital care accounts for the majority of inputs, outputs and quality adjustment.

Inputs

- Capital consumption cannot be split between HCHS and Family Health Services (FHS) and has therefore been excluded (see para 4.7.3 from *Healthcare extended analysis paper*[1]).
- The inputs are from data for England and Wales.
- Assumptions have been made about the allocation of categories of expenditure to HCHS, and then to allocate between HCHS Labour and HCHS Goods and Services.
- The data for HCHS inputs was published in section 4.7 from the *Healthcare extended analysis paper*.

Outputs

- ONS healthcare quality adjustment consists of three aspects. The impact of these on overall healthcare can be found in table 2.7 of *Public Service Output, Inputs and Productivity: Healthcare*[2]:
  - *Survival, health gain and waiting times* has been used to adjust HCHS as it specifically relates to HCHS.
  - *Outcomes from primary medical care* specifically relates to FHS (primary care) and therefore cannot be used to quality adjust HCHS.
  - *Service is responsive to user needs* relates to both HCHS and FHS (primary care) and therefore has been excluded from the quality adjustment used.

1 http://www.statistics.gov.uk/articles/nojournal/healthcare-extended-analysis-2010.pdf
2 http://www.statistics.gov.uk/articles/nojournal/healthcare-productivity-2010.pdf

Labour Productivity calculation

18 This element of our work was designed to give comparative figures to the productivity gains expected by the new workforce contracts. The measures were calculated as follows (with indices set to 100 for 1995):

$$\text{NHS labour productivity} = \frac{100 * \text{ONS NHS output index (adjusted for quality)}}{\text{NHS staff numbers index}}$$

$$\text{Hospital (HCHS staff) labour productivity} \quad \frac{100 * \text{ONS HCHS output index (adjusted for quality)}}{\text{NHS staff numbers index}}$$

For the above calculation consultant numbers were removed from HCHS staff figures

$$\text{Consultant productivity} \quad \frac{100 * \text{ONS HCHS output index (adjusted for quality)}}{\text{Consultant numbers index (full-time equivalents)}}$$

19 These labour productivity measures are subject to the following observations:

- If services are contracted out, then the output could still be counted but the resources to provide this output might be categorised as 'goods and services' (and so not included as an input in the calculation) rather than 'labour'. The effect of this outsourcing would be to increase the labour productivity measure.
- Recalculating the HCHS labour productivity measure using the ONS index for labour inputs (rather than staff numbers), which weights for different types of staff, suggests that some of the growth in labour productivity is due to a change in staff-mix in favour of higher paid grades. The measure using the ONS index for labour inputs was not reported in the main report since it was not directly comparable to the figures set out in the Department's business case on pay modernisation, submitted to HM Treasury in 2002.

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