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Department of Health

Managing high value capital equipment in the NHS in England

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National Audit Office

Department of Health

Managing high value capital equipment in the NHS in England

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Amyas Morse
Comptroller and
Auditor General

National Audit Office

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This report examines the management of three types of high value equipment in the NHS in England. It covers Magnetic Resonance Imaging (MRI) and Computed Tomography (CT) scanners, used for diagnosis, and Linear Accelerator (linac) machines for cancer treatment.

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Contents

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This report can be found on the National Audit Office website at www.nao.org.uk/nhs-equipment-2011

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Summary

Introduction

1 In the past three years, NHS trusts in England have spent around £50 million annually on purchasing three specific types of high value capital equipment – Magnetic Resonance Imaging (MRI) and Computed Tomography (CT) scanners, used for diagnosis, and Linear Accelerator (linac) machines for cancer treatment. The current value of these three types of machines in the NHS is around £1 billion. The NHS in England employs around 2,200 consultant radiologists and 12,000 diagnostic radiographers, and a proportion of these will work with CT and MRI machines, but the proportion is not known. Around 500 consultant clinical oncologists, 2,100 therapeutic radiographers, and 1,150 physicists work with linac machines (**Figure 1**).

2 Radiotherapy can be used both as a curative treatment for cancer and for palliative care. Half of cancer patients should receive radiotherapy as part of their treatment but its usage has been low in England compared to expected levels. The Department has taken successive approaches to increase access to radiotherapy treatment, most recently in its 2011 *Improving Outcomes: A Strategy for Cancer*. Demand is also driven by the ageing population with new cases of cancer predicted to increase by around a third between 2001 and 2020. Demand for scanning equipment has been driven by a focus on reducing waiting times, and increasing clinical application of the equipment across the NHS. For example, the ability of scanning equipment to allow early diagnosis and provide timely intervention within areas such as cancer, stroke, dementia and major trauma.

3 The number of scans carried out for NHS patients from CT and MRI machines has increased almost threefold in the last ten years, while for linacs the number of radiotherapy treatment sessions (fractions) has increased two and a half-fold. Ninety four per cent of trusts have MRI and CT scanners, 29 per cent have linac machines in 49 radiotherapy centres. Machines for diagnostic scanning (CT and MRI) and for radiotherapy treatment (linac) are used by different clinical teams and have different management processes. There are considerable differences in their planning and management, but there are also similarities which this report seeks to draw out.

Figure 1
The three types of machines examined in this report

Radiologists are doctors who analyse images of the body for diagnosis. Diagnostic radiographers produce, appraise and interpret images from diagnostic equipment. Clinical oncologists are doctors who diagnose and treat cancer using radiotherapy and chemotherapy. Therapeutic radiographers manage and deliver care, support and treatment across the radiotherapy treatment pathway. Physicists are clinical scientists who develop, plan and implement patient treatment programmes and, alongside technologists and engineers, are key members of radiotherapy teams.

Machine	What the machine does	Purchase cost per machine[1] (£)	Total NHS machines (England)	Life (years)	Average age of existing machines (years)
Computed Tomography (CT)	Used for imaging the brain, chest, abdomen and pelvis, for identifying the stage a cancer has reached, and for trauma and stroke assessment.	579,000	Total: 426 376 installed in the last 10 years	7-10	6.2
Magnetic Resonance Imaging (MRI)	Used to evaluate the central nervous system, spine, bones and joints but also for complex cardiac, vascular and body imaging.	895,000	Total: 304 267 installed in the last 10 years	7-10	6.3
Linear Accelerator (linac)	Used in radiotherapy, for treating patients with cancer. It is used to treat all parts and organs of the body, delivering a targeted dose of high-energy x-ray to the patient's tumour.	1.4 million	Total: 246 currently in use in 49 NHS trusts	10	6.5

NOTES

1 Average NHS Supply Chain prices in 2009 and 2010, excluding VAT. Actual costs vary according to specification. Includes installation costs (but not the £1-1.5 million cost of bunkers needed for additional linac machines). After purchase, machines incur additional costs of maintenance, staff to operate them, and running costs (e.g. energy). The lifetime maintenance cost of machines is broadly equivalent to their purchase cost.

2 Numbers of CT and MRI machines are from Health Protection Agency (HPA) data, representing a snapshot of total machines at the end of 2010. Number of linac machines is from the Radiotherapy Dataset. Number installed includes replacement and additional machines. Average age is based on HPA data.

Source: National Audit Office examination

4 During the 1990s, the UK's number of these types of machines for its population was much lower than other developed countries. In 2000, the Department of Health introduced its Cancer Equipment Programmes to manage funds provided centrally under various schemes to increase the replacement, and overall numbers, of these machines. Between 2000 and 2007, the centrally funded programmes spent £407 million on new capital equipment, resulting in greater numbers of CT, MRI and linac machines to spur implementation of increased diagnostic and treatment capability. During 2000-2007 the Programmes accounted for around three quarters of new and replacement machines purchased for the NHS in England.

5 The Department currently has no plans for any further such centrally driven programmes. From 2007-08, the capital funding system for trusts has changed with capital now being funded from trust revenue and loans. Trusts now take financing decisions for delivering services from machines (whether purchasing, leasing or managed equipment services), and have to recover the costs of financing through the revenue they generate from commissioners, while acting as a provider in an increasingly competitive market. Although machines maybe used for longer than their expected working life, they become more expensive to maintain and may not be capable of delivering the latest techniques required by clinicians. They may also suffer more downtime when they cannot be used for the benefit of patients.

6 Continuing demand pressures include increased focus on diagnostics for early identification of disease, and the Department's aim of increasing access to radiotherapy services. The Department expects increases in the demand for CT and MRI scans to continue, driven by technological improvements and clinical decisions. For radiotherapy, whilst current provision of linacs is around 4.8 per million population, within ten years the clinical need is expected to exceed 6 per million. As well as replacing current stock, approximately 60-80 new linacs will be needed in this period.

7 The significant investments made during 2000-2007 purchasing replacement and additional machines present the challenge in future years as to how the costs of replacing machines will be met as they reach the end of their useful life. More immediately, the NHS faces the challenge to make better use of existing capacity in the current financial climate, as the Government aims to deliver up to £20 billion of efficiency savings in the NHS by the end of 2014-15. Furthermore, in its 2010 Spending Review, the Government announced a 17 per cent reduction in capital spending for the NHS over the next four years, from £5.1 billion in 2010-11 to £4.6 billion in 2014-15.

Scope of our study

8 This report examines how efficiently these three types of high value equipment are used. We examine:

- Planning for high value equipment (Part Two)
- Meeting the demand for services (Part Three)
- Improving management of high value equipment (Part Four)

Key Findings

On planning

9 Trusts make their own assessments of demand largely independently of each other. Although the Department publishes data on activity, there is very little coordination of planning across the NHS for identifying increasing demand for scanning services and how it can be met. For some services such as stroke (for CT and MRI) and cancer (for linacs), networks covering populations of 1-2 million have a role in helping to identify demand and how to meet it.

10 We estimate that around half of all three types of machine across the NHS are due for replacement within three years, and 80 per cent of machines are due for replacement within six years (based on ten year lifetimes). Were trusts to purchase machines to replace existing ones they would collectively need to find around £460 million within three years and a further £330 million within six years. As well as replacing machines, trusts could look at other options including leasing machines, contracting out or extending the use of existing machines. Existing linac capacity lies almost entirely in the NHS, with activity rarely commissioned from the private sector. Contracting of NHS diagnostic scanning is more common, with around 10 per cent of MRI scanners providing NHS services managed by the private sector.

On acquisition and maintenance of machines

11 Trusts are not making best use of existing framework agreements which could secure lower prices on purchase of new machines, and lack independent procurement advice on how their needs can be met. Increasingly, hospital trusts have freedom to decide what equipment they buy and how they buy it. A framework agreement organised by NHS Supply Chain was used for three quarters of purchases of the three types of machines in 2009 and 2010, but with no aggregation of volume (individual trusts working together to group demand). Trusts also lack independent procurement advice when purchasing new machines or new types of machines to help them decide the appropriate level of functionality to meet their operational clinical need.

12 Trusts have no mechanism to determine if they have the appropriate type of maintenance for their CT and MRI machines. Maintenance costs vary depending on the age of machine, service specification, manufacturer, how the maintenance contract was set up, and whether some maintenance can be carried out in house. NHS Supply Chain framework contracts account for around two thirds of all maintenance costs of CT and MRI machines, to a value of around £27 million a year. However, of the trusts we visited none assessed how their maintenance costs compared with other trusts. For linac machines, maintenance is carried out largely by trusts themselves.

On meeting the demand for services

13 The workforce to support delivery of scanning and radiotherapy has increased but shortfalls in capability to deliver services remain. Despite increasing demand for scans, many trusts had vacancy rates in 2009 for consultant radiologists of around 7 per cent. The situation is marked for radiotherapy, as rates of attrition are high for people training to become therapeutic radiographers delivering radiotherapy treatment, with one third of those due to qualify in 2010 leaving before the end of their course.

14 There are wide variations in opening hours of units. Imaging departments have to provide round-the-clock services for patients referred in an emergency. Otherwise, we found that opening times for MRI units ranged from 40 to over 100 hours per week, and for CT units from 40 to 90 hours per week, with some trusts offering seven-day-a-week services with extended hours. Scanning services restricted to 9am-5pm five days a week are not always sufficient to cope with demand, and expensive equipment can lie idle for much of the week. For radiotherapy, a 2007 report by the National Radiotherapy Advisory Group recommended extended hours for some units, but there is uncertainty about the willingness of patients to attend for treatment outside traditional opening times.

15 There are wide variations in the time taken for scans to be performed. By 2009, the activity levels for MRI and CT increased, virtually eliminating waits for scans of over six weeks, as part of the Department's 18 week referral to treatment target. However, the percentage of people waiting under two weeks from referral for an MRI scan in 2009-10 varied between trusts from below 20 per cent to 93 per cent. For CT scans, the percentage varied from 33 per cent to 98 per cent.

On improving the management of high value equipment

16 Trusts lack accurate information on unit costs and a means to compare them. A 2007 Healthcare Commission review identified wide variations in unit costs between imaging services in hospitals and recommended action to reduce unexplained variation. This has not been addressed. Although trusts report their unit cost per scan, they record these differently, and have no means to compare costs with other trusts.

17 There are no systematic means to enable trusts to assess how efficiently they are using their MRI and CT scanning machines. We found wide variations in utilisation rates of scanning machines. NHS trusts are unable to compare throughput and efficiency of machines with other trusts as there is no repository of data to do so. Utilisation rates for individual CT and MRI machines or for trusts cannot be identified from existing national data. Trusts therefore lack information on activity and costs to compare their efficiency of machine use with other trusts or with private sector benchmarks.

18 For radiotherapy, new information is becoming available which will enable comparisons of efficiency and throughput of radiotherapy centres. For trusts delivering radiotherapy treatment, a mandatory Radiotherapy Dataset was introduced in 2009. This shows a two and a half-fold variation in average fractions per linac between radiotherapy centres, which the Department is investigating.

19 There are opportunities to improve the efficiency of the operation of machines. We found examples of how trusts had evaluated the configuration of their services and have taken steps to improve their efficiency of machine use, by:

- achieving the right skill mix to support throughput;
- assessing the flexibility of working patterns and opening hours;
- strong engagement between finance and clinical teams;
- using the right data to measure performance; and
- assessing design and flow to support the patient pathway.

Conclusion on value for money

20 NHS trusts do not have the means to know if they are making best use, or getting best value out of their high value equipment. Equally, they do not have the means to determine if they are getting value for money from purchasing or maintenance. There are significant variations in levels of activity between trusts, and a lack of comparable information about performance and costs. In these circumstances the planning, procurement, and use of high value equipment is not achieving value for money across all NHS trusts.

Recommendations

21 Our findings point to recommendations in three areas:

For the NHS in England

a **The NHS Commissioning Board should set standards for accurate and comparable data in the use of high value capital equipment.** The Department's proposed approach to information set out in *An Information Revolution* (October 2010) states that good commissioning requires high quality timely data about needs and services and the ability for commissioners to benchmark against comparable areas and between providers. The NHS Commissioning Board should set standards for data on availability, throughput, and unit costs of high value capital equipment so that this information is available to trusts and commissioners.

b **The Department of Health (for 2012-13), and the NHS Commissioning Board (for 2013-14 and thereafter) should design tariff prices in a way that incentivises efficiency of use of machines and recognise that trusts may need to find several hundred million pounds to replace machines over the next ten years.** The NHS Commissioning Board in designing the structure of the tariff, and Monitor in setting prices, should consult on how to improve unit cost information for scanning and radiotherapy machines, and address how tariffs can improve their efficiency of use.

c **As part of its Quality, Innovation, Productivity and Prevention (QIPP) savings programme, the Department should examine how well equipped trusts are to understand the value in their acquisition decisions** including the extent to which they use framework agreements to secure good value deals for purchase and maintenance of high value equipment.

d **Across the NHS, there needs to be a means by which hospital trusts can objectively determine the right specification of machine for their needs, and be assured that they are gaining value for money from procurement decisions.** Since April 2010, following the decommissioning of the Centre for Evidence Based Purchasing, there has been a lack of independent advice to help trusts decide what functionality they need when purchasing machines. The Department should explore ways in which Trust Boards can be confident that they have the right specification of machinery when making new equipment purchases. It might, for instance, consider with the National Institute for Health and Clinical Excellence (NICE) how learning can be applied from the Institute's technology appraisals and its new Diagnostic Assessment Programme.

For NHS trusts acting together

e Greater savings and efficiencies for the NHS can be secured if trusts plan their decision-making in the light of capacity required beyond individual trusts, for example, cancer networks, which typically cover 1-2 million people, help identify demand for cancer services and how to meet it. However, it is not clear what

the future of such supra-trust structures are. Cancer networks have guaranteed funding until 2012 but the issues of purchase and maintenance of new equipment will persist far beyond that time frame. Whatever NHS structures develop, we consider there is more scope for trusts to act together in the following ways in the interests of patients and value for money:

i **Trust Boards should participate in benchmarking activity to compare prices with other trusts, and look for opportunities to group their demand for machines with other trusts to secure savings on the price of machines.**

ii **The management of trusts should be able to demonstrate to Trust Boards that they have appraised the value of using framework agreements for the purchase of new machines and demonstrate, if they have not used framework agreements, that they have secured a lower price when purchasing machines.**

iii **GP consortia should work together to assess levels of demand expected across a wider locality when considering purchase of new machines, and establish the extent to which they might combine plans with other consortia to fund the capacity needed to meet demand.**

For individual NHS trusts

f **Clinical and finance teams within trusts should assess the costs and benefits of purchasing, leasing and outsourcing when replacing machines, and check for alignment with their planned levels of activity.** As around half of machines are due to be replaced within three years, trusts need to plan their procurement now so that they can manage the risk of incurring higher costs, for example, extra maintenance costs or not achieving savings through aggregating requirements with other trusts seeking to replace their equipment to a similar timescale. Trust Boards should also scrutinise their existing deals for maintenance of machines by assessing current arrangements against, for example, the Department's NHS Procurement Diagnostic Tool.

g **Trusts should look critically at the arrangements they have for meeting the demand for scans and for radiotherapy and consider whether they have sufficiently robust planning and flexibility in place to minimise the need for overtime.** They can do this by collecting the right data to measure demand and capacity, examining trends and expected patterns in scanning and radiotherapy treatment and checking that they are using a combination of staff skills and extended hours in the most efficient way to maximise use of equipment for the convenience of patients. Planning should also focus on recruitment and retention of staff, including physicists, technologists and engineers.

h **Trusts should assess the efficiency of their arrangements for delivery of services by exploiting existing good practice, using the work of NHS Improvement.** Part Four of this report sets out how trusts can evaluate their processes and test the efficiency of services.

Part One

Introduction

1.1 Delivery of effective patient care depends on many different types of equipment. Scanning machines are increasingly important for diagnostics and tracking the progress of many conditions.[1] This report examines Computed Tomography (CT) and Magnetic Resonance Imaging (MRI) scanning. Machines can also provide treatment for patients, and this study also examines the use of linear accelerator (linac) machines for radiotherapy, which are important for the treatment of many cancers. Over the past three years, on average around £50 million has been spent by trusts in England annually on the purchase of these three types of machines, compared with around £80 million on average annually between 2001 and 2007.[2]

Previous reports have identified the importance of high value equipment

1.2 The Healthcare Commission's 2007 report *An improving picture? Imaging services in acute and specialist trusts* identified wide variations in productivity and unit costs of machines, which could not be explained. Radiographers in some hospitals performed more than twice as many examinations each year (after taking account of case mix). It also identified an urgent need to standardise measurement of imaging activity, and to recognise the differing requirements for resources of each type of activity. According to a more recent report, large variations remain in usage rates for diagnostic and radiotherapy equipment.[3]

1.3 CT scans are vital for the assessment of major trauma patients as they provide rapid and detailed information on injuries and the site of any internal bleeding, reducing the need for additional investigations and decreasing the time to get care. The NAO's report *Major trauma care in England*, showed that a significant number of patients who need a scan do not receive one. Improved scanning services has also been a thrust of the Department's 2007 *National Stroke Strategy*, which responded to the Committee of Public Accounts' concerns about access to scanning equipment for suspected stroke patients.[4]

1 In 2009-10, 22 million scans – the vast majority – were conducted using x-ray, which is a cost-effective method for providing information at low doses of radiation for a wide range of investigations, for example, orthopaedics and broken bones.
2 All costs are in 2009-10 prices.
3 Taxpayers Alliance, *NHS Machines – Utilisation of high value equipment at NHS Trusts*, 2009.
4 Committee of Public Accounts, *Reducing brain damage: faster access to better stroke care*, July 2006.

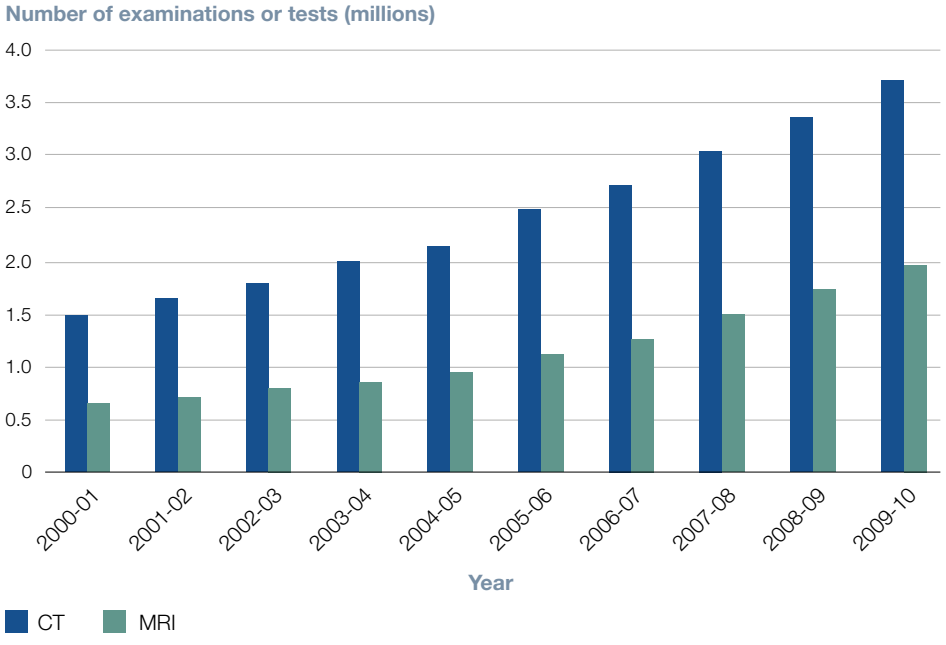
1.4 Appropriate use of radiotherapy as a treatment contributes to improved cancer survival, with radiotherapy estimated to contribute to 40 per cent of cases where a cancer is cured. Greater provision of radiotherapy services was identified as a need in *The NHS Cancer Plan* in 2000. A 2007 report by the National Radiotherapy Advisory Group (NRAG) identified an increasing unmet need for radiotherapy treatment and concluded that commissioners needed to commission more attendances for their populations, with a 13 per cent gap between those patients receiving radiotherapy treatment and those who could benefit from it (half of cancer patients).

1.5 The Department's 2007 *Cancer Reform Strategy* identified the need for better data to improve understanding of radiotherapy activity, treatment and outcomes nationally, and its *Improving Outcomes: A Strategy for Cancer* 2011 aims to improve active treatment rates. These key strategies set out a need to improve access, reduce travel times and increase fractions delivered. Demand is also driven by the ageing population with new cases of cancer predicted to increase by around a third between 2001 and 2020.

The demand for services using high value equipment is increasing

1.6 Since 2000, the number of MRI and CT scans provided for NHS patients has increased almost threefold (**Figure 2**). The number of CT scans by trusts has increased by 150 per cent from 1.49 million in 2000-01 to 3.72 million in 2009-10. The number of MRI scans has increased by 211 per cent from 0.63 million in 2000-01 to 1.97 million in 2009-10. The Department expects increases in the demand for CT and MRI scans to continue, driven by technological improvements and clinical decisions.

Figure 2
Imaging examinations, 2000-01 to 2009-10

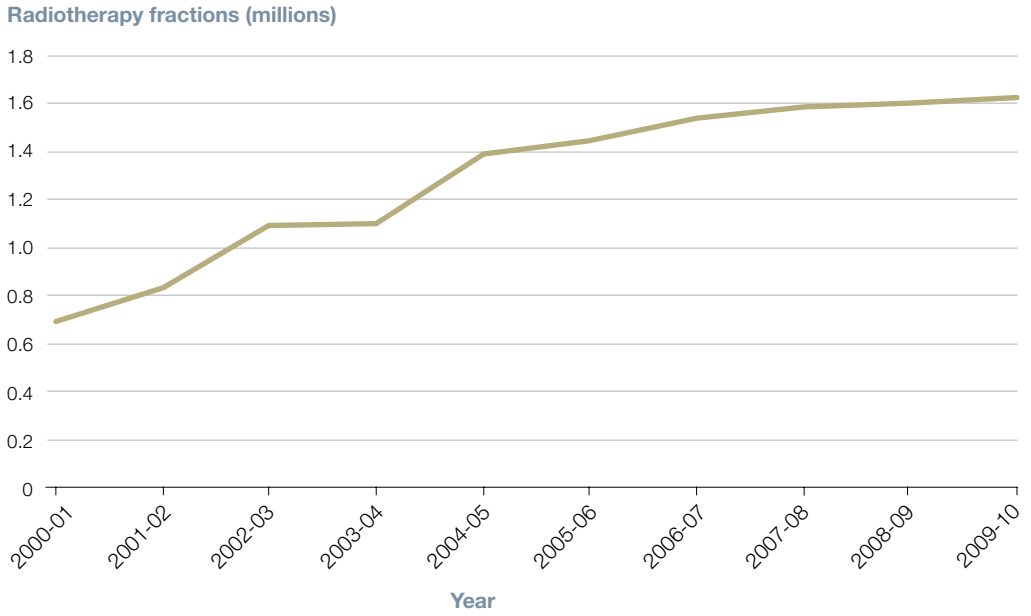


Source: Department of Health KH12 returns from NHS trusts

1.7 For radiotherapy, the number of treatments (fractions) delivered by the NHS has increased by 136 per cent from 0.69 million in 2000-01 to 1.63 million in 2009-10 (**Figure 3**). The increase is largely driven by improved access to radiotherapy treatment. The current radiotherapy capacity has been modelled on continued increases in demand.

Figure 3

Increasing demand for radiotherapy, 2000-01 to 2009-10



NOTE

1 For 2008-09, the number of fractions is the average for 2007-08 and 2009-10.

Source: UK national radiotherapy equipment survey (2008) and the Radiotherapy Dataset (2009-10, provided by NATCANSAT).

Substantial volumes of new equipment were introduced through the Department's 2000-2007 Cancer Equipment Programmes

1.8 Cancer has been the main policy area driving replacement and additions of new machines over the past decade. The 2000 Cancer Plan identified inadequacies in provision and ageing, and unreliable CT, MRI and linac equipment used in cancer services, with high waiting times for patients needing procedures performed by these machines. To address this, the Department's Cancer Equipment Programmes aimed to deliver between 2000 and 2007 a more even distribution of machines across the country and to reduce the average age of machines. The resulting procurement programmes closed in 2007 having invested £407 million on replacement and additional machines[5] (**Figure 4**). Three quarters of CT, MRI and linac machines purchased between 2000-2007 were covered by the Programmes.

5 National Audit Office analysis of Cancer Equipment Programmes report.

Figure 4
Machines purchased during the 2000-2007 Cancer Equipment Programmes

	CT	MRI	Linac
Replacement machines	149	78	127
Additional machines	84	84	50
Total	233	162	177
Replacement as percentage of total	64	48	72
Additional as percentage of total	36	52	28

Source: Department of Health report on the Cancer Equipment Programmes

There are 976 of the three types of machine in use in NHS trusts

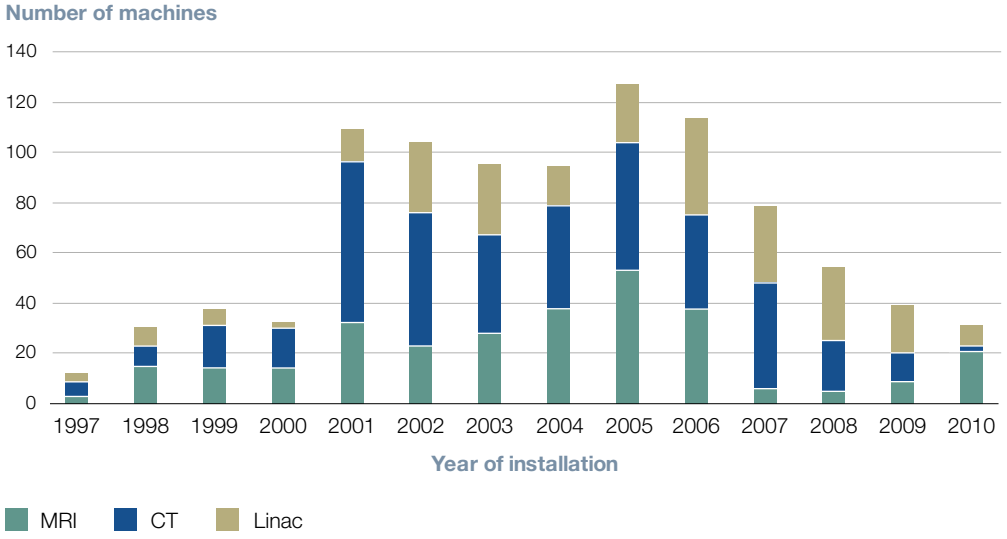
1.9 Ninety four per cent of trusts have CT and MRI scanners. Currently there are 426 CT and 304 MRI machines in use in the NHS. For radiotherapy, 29 per cent of trusts have linac machines with trusts offering services in 49 radiotherapy centres, with 246 linac machines currently in use.

1.10 **Figure 5** overleaf shows the number of new machines introduced in the NHS since 1997. Existing linac capacity lies almost entirely in the NHS (non-NHS capacity is less than 2 per cent of NHS capacity), with activity rarely commissioned from the private sector. Private sector involvement in diagnostic scanning is more common, with around 10 per cent of MRI scanners providing NHS services managed by the private sector.

1.11 Costs of machines can vary considerably depending on their specification. For MRI, 84 per cent of machines are of standard specification (in terms of magnetic strength), while 6 per cent of machines are high end specification and 10 per cent are basic specification. For CT, 54 per cent of machines are of average specification (primarily in terms of number of slices), while 4 per cent are high end and 42 per cent are low specification or are no longer manufactured. For linac, functionality has increased in recent years to offer more developed techniques, for example Image Guided Radiotherapy.

Figure 5

Linac, CT and MRI machines purchased by the NHS, 1997 to 2010



NOTES

1 15 per cent (MRI), 11 per cent (CT), and 13 per cent (linac) of the current stock of machines is over 10 years old.

2 Both the Health Protection Agency (HPA) and the Radiotherapy Dataset collect data on the number of linac machines in use. The Radiotherapy Dataset was introduced from April 2009, but the HPA data provide trend information. Trusts do not always report to HPA when their equipment is taken out of use, so this data source may inflate the existing stock of machines.

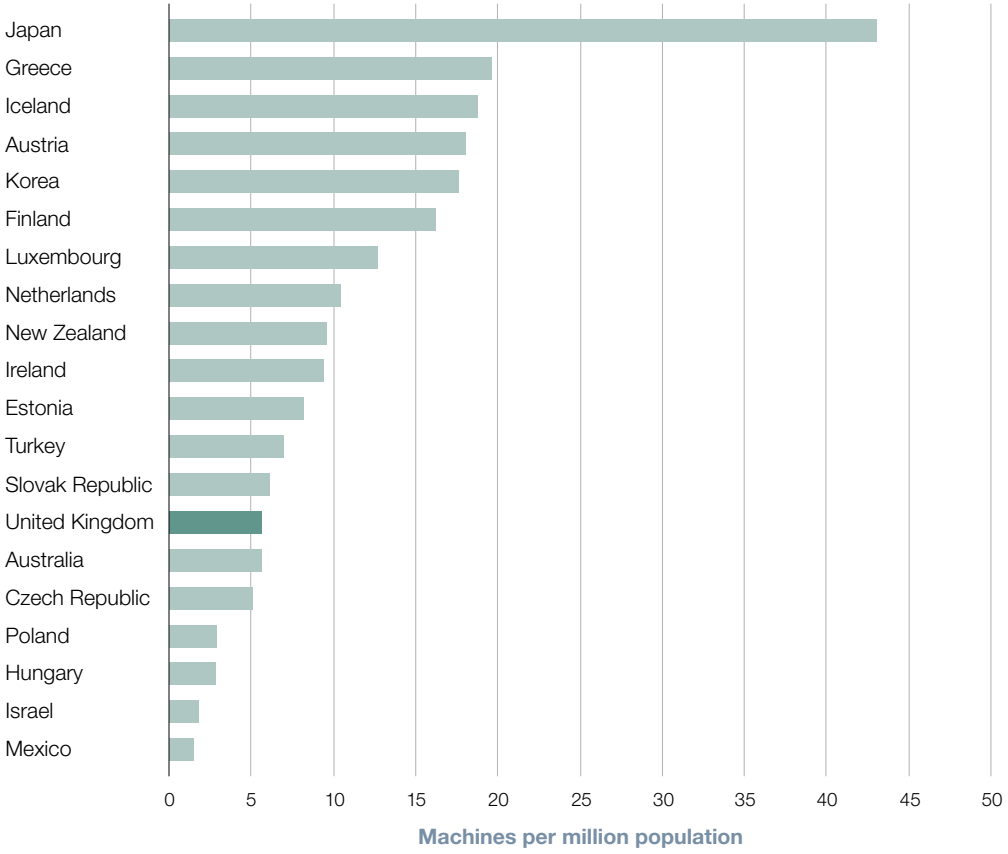
Source: National Audit Office analysis of Health Protection Agency data

The UK still has fewer machines than other countries

1.12 Ten years ago the UK's provision of machines per million population was significantly lower than other European countries. An analysis carried out by the Organisation for Economic Co-operation and Development (OECD) for 2008[6] showed the level of machines in the UK was still below that of most other countries (**Figures 6, 7** and **8**). The OECD data shown in these Figures reflect the latest data (2008) available to compare the UK with other countries. OECD data are available for previous years which include comparisons for CT and MRI with countries such as USA, Canada and Italy, but not for radiotherapy machines for USA and Canada. The UK's relative position in these datasets for earlier years is broadly similar to that presented for 2008.

6 OECD, Health Data (2010).

Figure 6
MRI machines per million population, 2008

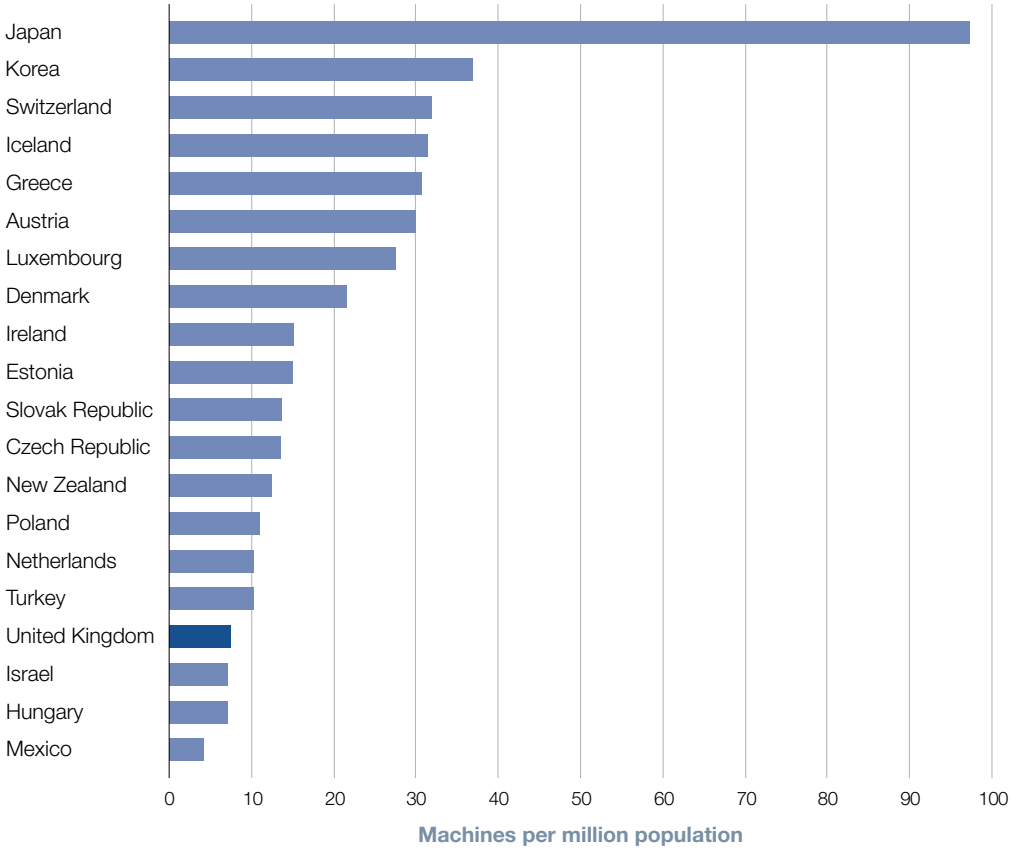


NOTE

1 In 2010, there were six MRI machines per million population in the NHS in England.

Source: Organisation for Economic Co-operation and Development

Figure 7
CT machines per million population, 2008



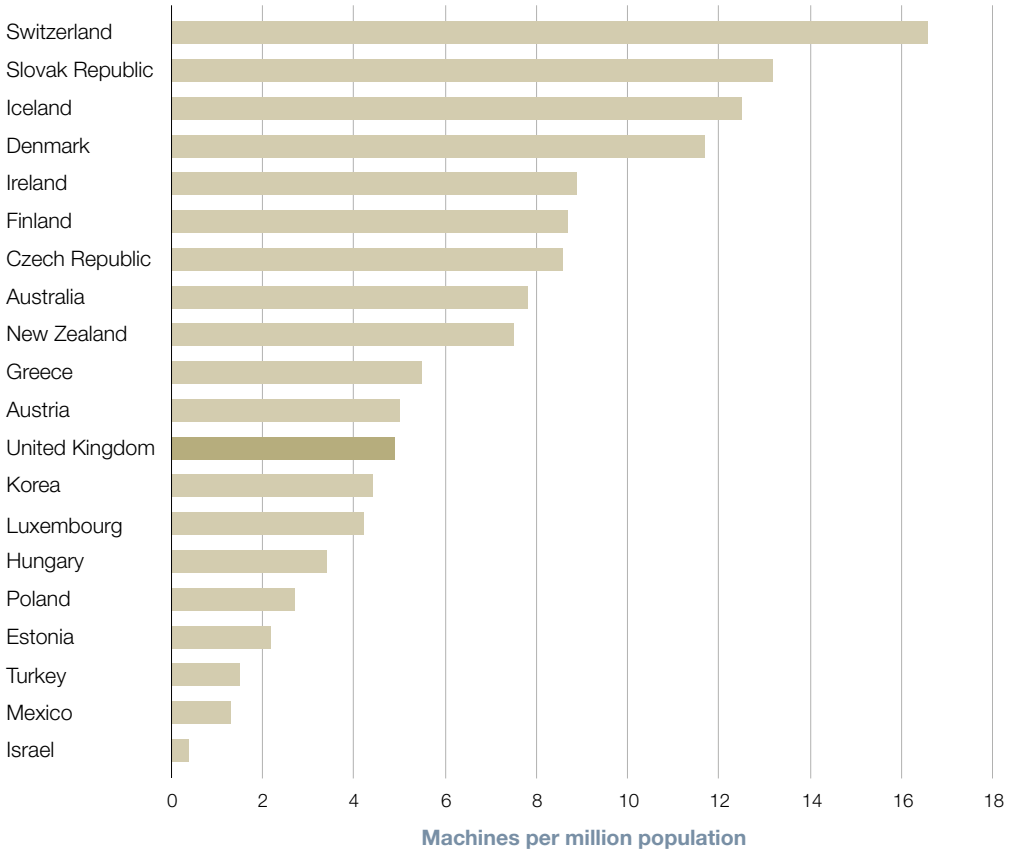
NOTE

1 In 2010, there were 8.4 CT machines per million population in the NHS in England.

Source: Organisation for Economic Co-operation and Development

Figure 8

Radiotherapy treatment machines per million population, 2008



NOTE

1 In 2010, there were 4.8 linac machines per million population in the NHS in England. Radiotherapy treatment machines other than linac machines are also used in the NHS.

Source: Organisation for Economic Co-operation and Development

Part Two

Planning for high value equipment

2.1 From April 2013, most services in the NHS will be commissioned by GP consortia, and by 2014, the Government wants all hospitals to become Foundation Trusts, with freedom to manage and make their own decisions, including for planning and procurement. The NHS Commissioning Board will hold consortia to account for performance and quality, and will also manage commissioning. Other infrastructures, such as cancer networks, may play a regional role advising on supply and demand of services, but it is not clear what the future of supra-trust structures is. There is therefore considerable uncertainty about how decisions on equipment will be informed locally.

Trusts' procurement is not maximising potential savings

2.2 Previous NAO reports have highlighted the potential benefits of public bodies working together to aggregate volume to obtain lower prices and reduce administrative costs. The *Review of collaborative procurement across the public sector*[7], found that public bodies were paying a wide range of prices for the same commodities, even when using existing framework agreements. In addition, it found that public bodies incurred unnecessary administration costs by duplicating procurement activity. The report concluded that, in addition to public bodies working together more effectively, there needed to be a clear framework to coordinate public sector procurement activity.

2.3 The Department's review of its Cancer Equipment Programmes found that the programmes had delivered reduced prices through aggregating demand for machines across trusts, and reported price savings of around £38 million. The programmes checked that trust's specification proposals were not beyond their likely needs during the lifetime of the machines, ensuring that redundant functionality was not purchased.

2.4 Since 2007, procurement activity has become less centrally coordinated and more locally determined. We found from our visits and from NHS Supply Chain that trusts largely base their procurement decisions on their local demand for services and do not coordinate planning with other trusts. Trusts face competing demands on their capital budgets, so will look at extending the life of existing machines, alongside other options such as leasing equipment or contracting out, as well as replacement. NHS Supply Chain[8] offers capital planning services which allow trusts to plan their future capital

7 National Audit Office and Audit Commission, *Review of collaborative procurement across the public sector,* May 2010.

8 NHS Supply Chain is a division of Excel Europe Ltd, which is a subsidiary of DHL, operating under contract to the Department of Health. It provides procurement services to the NHS, including several national framework agreements.

requirements and increase flexibility by making long-term plans, while still being able to amend requirements in the short-term. However, NHS Supply Chain told us that it is often only involved in the procurement process late on, after the planning stages. Within trusts, procurement teams are also often involved late in the process.

2.5 NHS Supply Chain operates a framework agreement[9] covering the three types of machines, with a separate framework for maintenance. During 2009 and 2010, framework agreements accounted for around three quarters of all purchases of CT, MRI and linac machines, and two thirds of the associated maintenance costs. The use of the framework agreement to purchase new machines will avoid trusts needing to undertake lengthy European Union procurement processes. However, there was no aggregation, through committed volume from trusts, when the framework was established. Furthermore, individual trusts do not act together to aggregate volume when using the framework. Of the machines purchased through the framework during 2009 and 2010, there are no examples of trusts acting together to aggregate volume.

2.6 NHS Supply Chain has worked successfully with trusts to aggregate volume for other capital equipment. NHS Supply Chain's planning team use trusts' capital equipment plans to identify aggregation opportunities and place multi-machine orders. This resulted, for example, in additional savings over the framework prices of 12 per cent for mammography, 16 per cent for ultrasound and 19 per cent for flexible endoscopy.

Half of equipment will be due for replacement within three years

2.7 We estimate that in the NHS, around one half of existing machines will be due for replacement within three years; and 80 per cent will be due for replacement within six years. We estimate that replacing all machines currently in service will cost the NHS £1 billion over the next ten years, comprising of £295 million (MRI), £283 million (CT) and £388 million (linac). **Figures 9** to **Figure 11** show the projected and actual replacement of CT, MRI and linac machines.

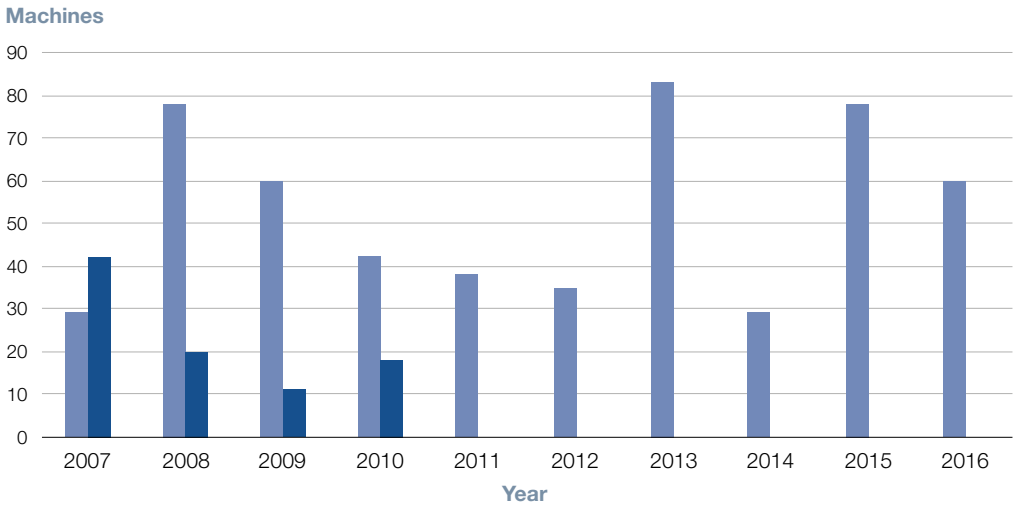
Trusts are responsible for replacing and upgrading their own equipment

2.8 The Department currently has no plans for any centrally driven programmes to replace existing machines when they expire. The Department's approach to the NHS suggests that trusts locally, working with commissioners, will assess supply and demand for services. The intention is for all trusts to become independent Foundation Trusts by 2014 and as such the Department will not directly control procurement practice. For some services such as stroke (for CT and MRI) and cancer (for linacs), networks help commissioners plan how to meet demand for populations of 1-2 million people. However the future of such structures is not clear with, for instance, cancer networks having guaranteed funding only until 2012.

9 A framework agreement covers the procurement of a particular type of good or service from pre-approved supplier(s) over a fixed time period. It usually specifies terms and conditions which will apply to contracts between suppliers and customers.

Figure 9
Projected and actual replacement of CT scanners

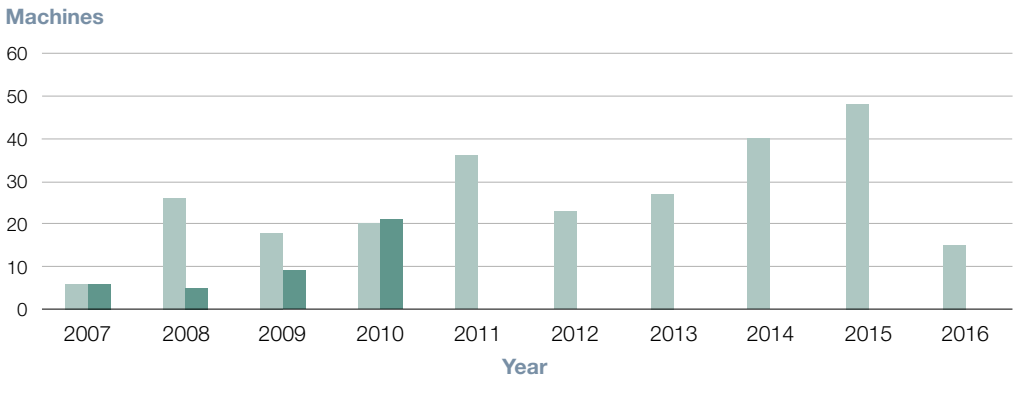
Departmental forecast compared to actual machines installed



Source: National Audit Office analysis and Department of Health Cancer Equipment Programmes report, 2007

Figure 10
Projected and actual replacement of MRI scanners

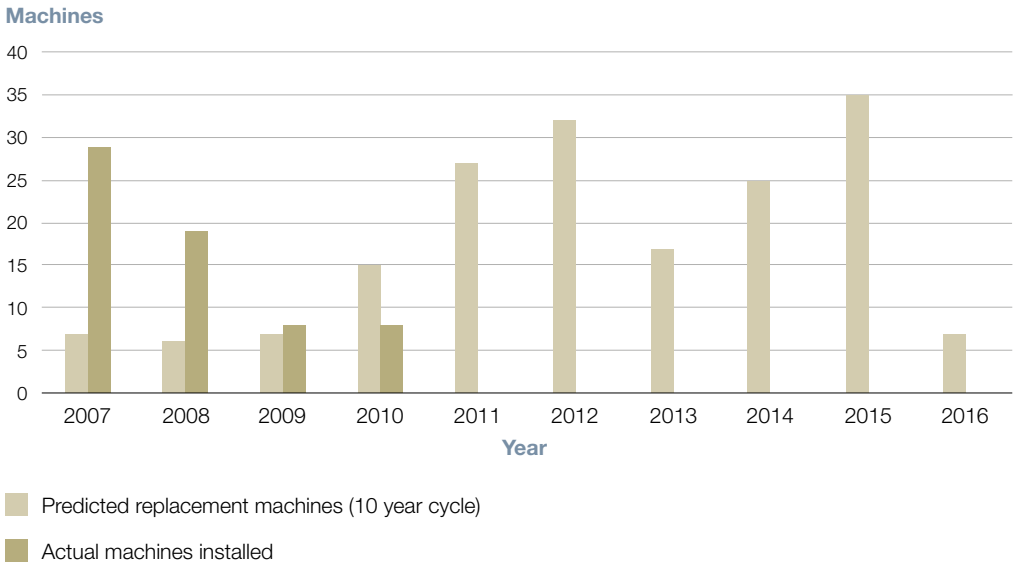
Departmental forecast compared to actual machines installed



Source: National Audit Office analysis and Department of Health Cancer Equipment Programmes report, 2007

Figure 11
Projected and actual replacement of radiotherapy treatment (linac) machines

Departmental forecast compared to actual machines installed



Source: National Audit Office analysis and Department of Health Cancer Equipment Programmes report, 2007

2.9 Trusts' decisions to replace machines are heavily influenced by their existing utilisation and their capacity to meet expected local demand. The Healthcare Commission's 2007 report highlighted that only 38 per cent of imaging departments had agreed a programme with their Primary Care Trust for replacing equipment. Decisions about the technical functionality of new machines are largely influenced by the extent to which trusts can 'future proof' against emerging areas of need such as clinical developments and an ageing population, and they seek to strike a balance between buying functionality that they need now and may need in the future, with the risk of buying redundant functionality which is never or only partially used. Trusts currently lack a source of independent procurement advice to help them decide what level of functionality is most appropriate to meet their operational clinical need when purchasing new machines or new types of machines.

2.10 Trusts' funding for replacement equipment is from three main sources: income from providing services, loans from the Department or other sources (such as private sector loans or charitable funding). Where existing machines were funded directly by the Department of Health or through the New Opportunities Fund, trusts did not bear their purchase costs. Some trusts may not have included depreciation of these assets in the reference costs they report to the Department, although the Department is clear that reported reference costs should reflect the full cost of providing a service including capital costs. Where capital costs have not been reflected in the costs paid by commissioners, trusts have to generate surpluses from other services they offer to meet the cost of replacement machines.

Part Three

Meeting the demand for services

3.1 This Part examines reasons for variations in the use of high value equipment and assesses the information available to trusts to determine how efficiently they are using machines.

There are variations in utilisation of radiotherapy machines

3.2 Our report *Delivering the Cancer Reform Strategy* found that use of radiotherapy machines varied significantly. While there may be valid reasons for these variations, we identified potential for existing capacity to be used more productively.

3.3 The mandatory Radiotherapy Dataset was introduced in April 2009, and is beginning to provide useful data for examining radiotherapy activity. The Department has made information available to allow commissioners and providers to benchmark performance and access to treatment, and will be publishing annual reports on the dataset.

3.4 Our analysis of the dataset indicated that there remains a significant variation in machine throughput across radiotherapy centres. During 2009-10, across 49 centres throughput per machine per centre varied from 4,200 fractions a year to 9,600 fractions a year (**Figure 12**). The Department is investigating why around 13 per cent of patients who could benefit from radiotherapy treatment are not receiving it.

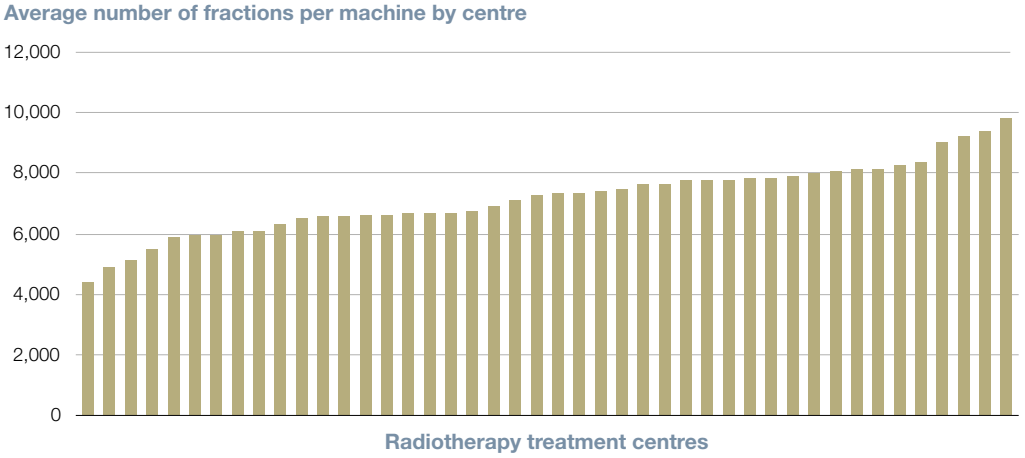
3.5 We examined what factors might influence throughput of linac machines, using linear regression. Although case mix alone has only limited correlation to average throughput per machine, we found that case mix of centres treating a high proportion of complex cases – haematology, nervous system and brain – are significantly correlated to higher numbers of radiographers per machine. Further analysis suggested that variations in staff level and case mix could explain between 40-50 per cent of the variations in throughput across all centres. Variations could also be due to differences in demand, patient preference, or clinical practice.

There are wide variations between trusts in opening times for MRI and CT units

3.6 We found a wide variation in opening times (**Figure 13**). The average opening time was 60 hours for MRI units and 50 hours for CT units.

Figure 12

Variations in use of linear accelerator machines for radiotherapy treatment, by centre, 2009-10



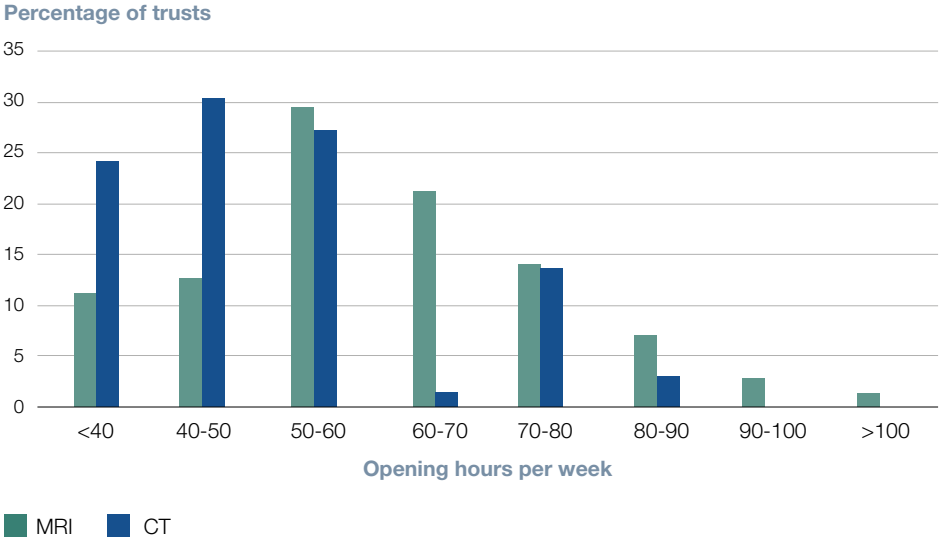
NOTE

1 Excludes top and bottom 5 per cent.

Source: National Audit Office analysis of the Radiotherapy Dataset

Figure 13

Opening hours for MRI and CT machines in NHS trusts



NOTE

1 Data cover 71 and 66 trusts for MRI and CT respectively and include normal opening hours only.

Source: National Audit Office examination

There is wide variation in the waiting times for scans

3.7 By 2009, waiting times of over six weeks after referral for MRI and CT scans had been virtually eliminated (from around 40,000 for MRI and 12,000 for CT at the start of 2007). However, there remains a large variation across the NHS in the percentage of people waiting under two weeks from referral for a scan (these data do not include the time taken to report on scans). **Figure 14** shows that, in 2009-10, the percentage of patients waiting under two weeks from referral for an MRI scan varied from below 20 per cent to 93 per cent. For CT machines, this varied from 33 per cent to 98 per cent (**Figure 15**). Waiting times data are currently not published for radiotherapy treatment.

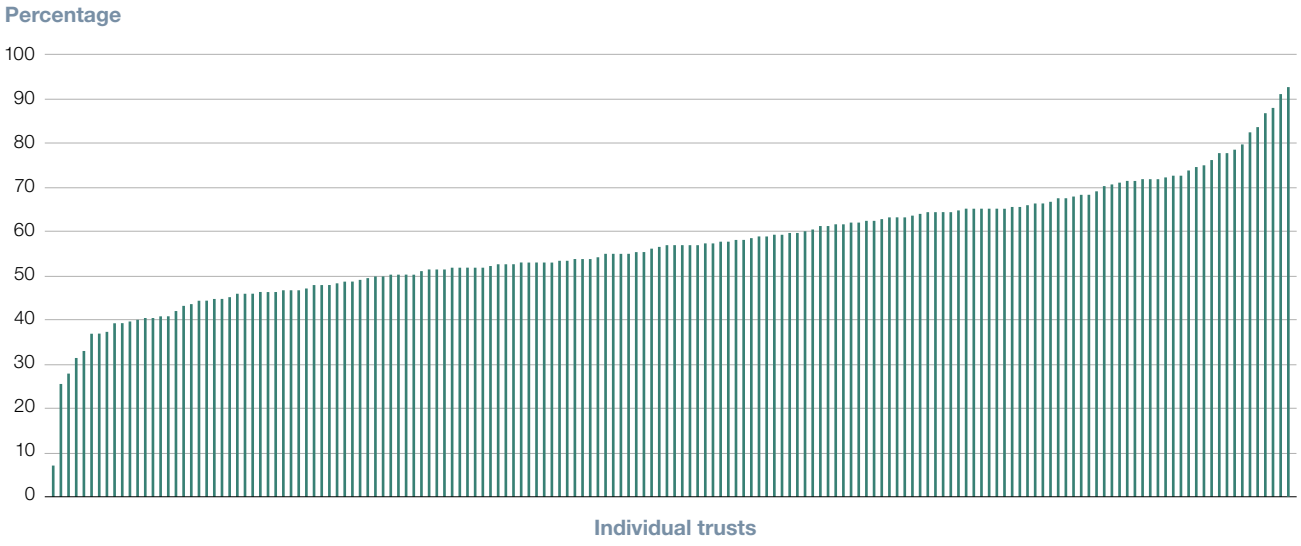
There is a lack of accurate measurement of activity and costs of running machines

3.8 The activity data collected by the Department for CT and MRI machines measures scanning activity by trust and at national level, but these data include NHS activity contracted out by trusts, so do not allow measurement of the utilisation of machines within trusts. From our visits we found variations in the average number of scans per CT machine per trust varied from around 7,800 to almost 22,000 in 2009-10. Some utilisation data are available from industry suppliers, but these data are rarely requested by the NHS.

3.9 Unit costs inform the charges made by the NHS for services, as tariffs are set for services, or packages of services, delivered by NHS providers, with commissioners charged according to the volume of services they commission. Currently, trusts record reference costs which show the average unit costs per scan and per fraction of radiotherapy treatment. While there are tariffs for MRI and CT scanning, these apply mainly to outpatients. Radiotherapy does not currently attract a separate tariff, but it is included in the costs paid by commissioners and is commonly paid for on a block contract basis. The Department is investigating tariffs for radiotherapy, in particular to incentivise use of the newest techniques (Intensity Modulated Radiotherapy and Image Guided Radiotherapy).

Figure 14

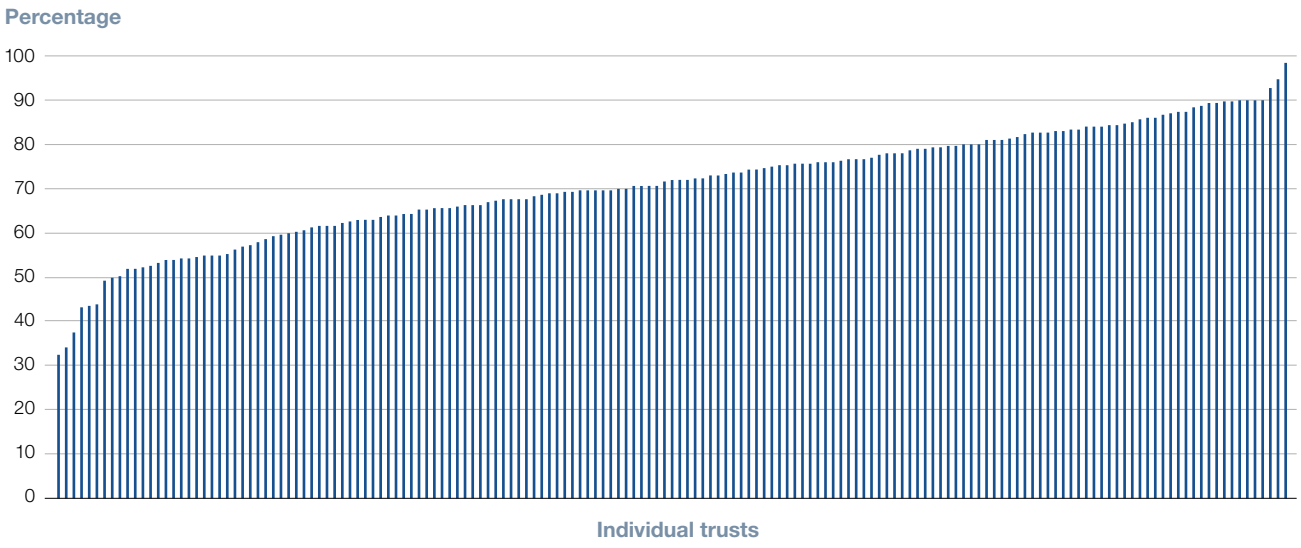
The percentage of people in each trust waiting under two weeks from referral for a MRI scan, 2009-10



Source: National Audit Office analysis of Department of Health waiting time data, average over the 12-month period

Figure 15

The percentage of people in each trust waiting under two weeks from referral for a CT scan, 2009-10



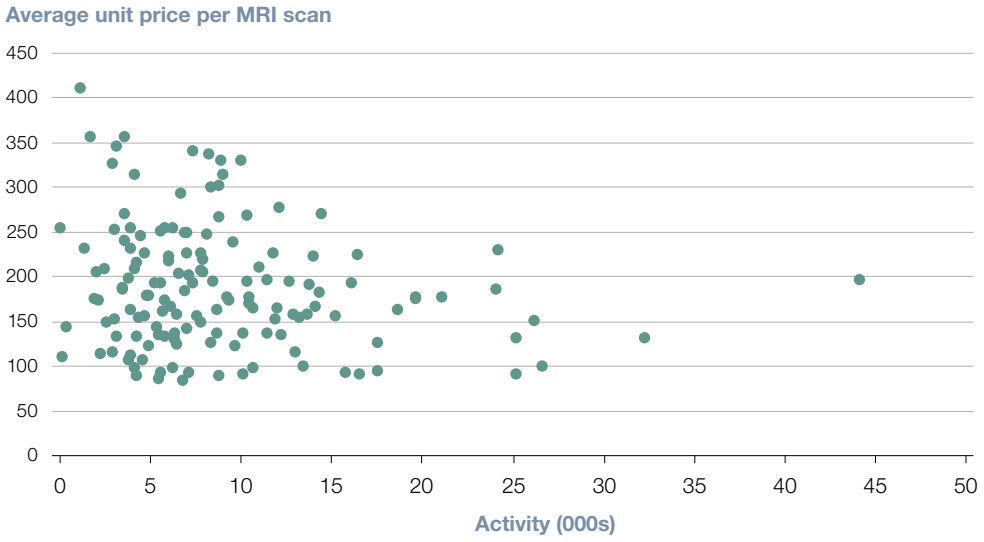
Source: National Audit Office analysis of Department of Health waiting time data, average over the 12-month period

3.10 Our analysis showed wide variations in the unit cost per scan across trusts for both CT and MRI machines. Unit costs bore little relationship to the number of scans carried out by trusts (see **Figure 16** for MRI). At 5 and 95 percentile, the average cost per CT scan in 2009-10 ranged from £54 to £268, with a national average of £121. For MRI, the average cost per scan ranged from £84 to £472, with a national average of £184.

3.11 For radiotherapy, average reported reference costs per treatment session (fraction) in 2009-10 ranged from £73 to £225 (5 and 95 percentile). The national average was £123 per fraction.[10] National work is underway to help trusts improve the coding and costing of radiotherapy activity, and to promote benchmarking between radiotherapy centres.

3.12 We found that the method for measuring unit costs is not consistently applied, as trusts may include different elements to calculate costs and may count volumes differently. This makes meaningful comparison and benchmarking of unit costs between trusts difficult, limiting trusts' ability to improve the efficiency of machine use. Without transparent data about unit costs, commissioners will be unable to compare the efficiency or cost-effectiveness of the services offered by different providers.

Figure 16
Average cost by trusts' activity level per MRI scan for 2009-10



Source: National Audit Office analysis of reference cost submissions

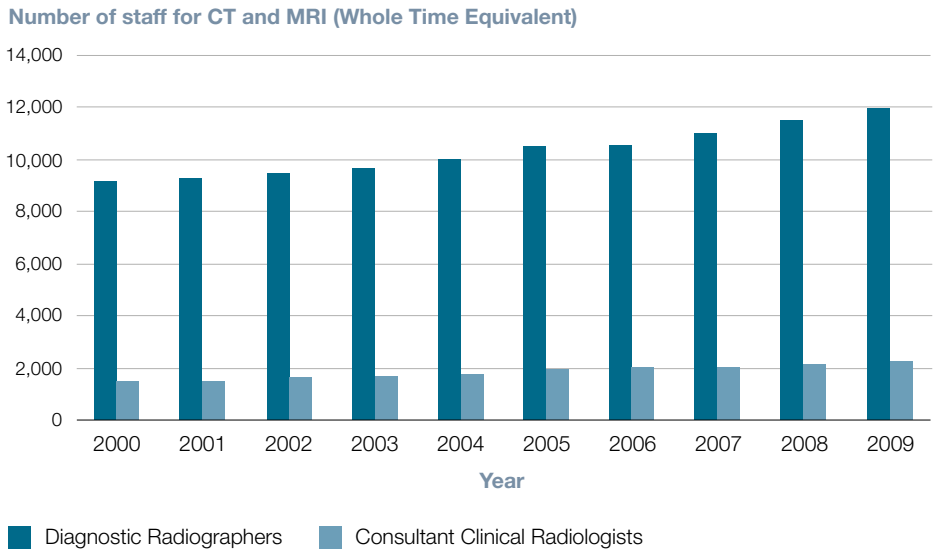
10 Organisation level reference cost submissions for fractions delivered by linac machines.

The workforce for scanning and radiotherapy has increased but shortfalls in capability to deliver services remain

3.13 A range of staff are needed to operate the three types of machine, with different clinical teams and different management processes for diagnostic scanning and radiotherapy. For scanning, the number of consultant clinical radiologists has increased by 53 per cent from 1,460 in 2000 to 2,235 in 2009, equivalent to 44 per million population, far less than the European Union average of 67 consultant radiologists per million population. The number of diagnostic radiographers has increased by 31 per cent from 9,169 in 2000 to 11,967 in 2009 (**Figure 17**).

3.14 Despite increasing demand for scans, it takes time to train the appropriate staff, and we found trusts had vacancy rates in 2009 for consultant radiologists of around 7 per cent. A 2009 Royal College of Radiologists survey of trusts found that 77 per cent of trusts used overtime arrangements to meet demand, and 37 per cent of trusts used outsourcing. However, 63 per cent of trusts deployed radiographers to report on scans.[11]

Figure 17
Workforce for imaging equipment



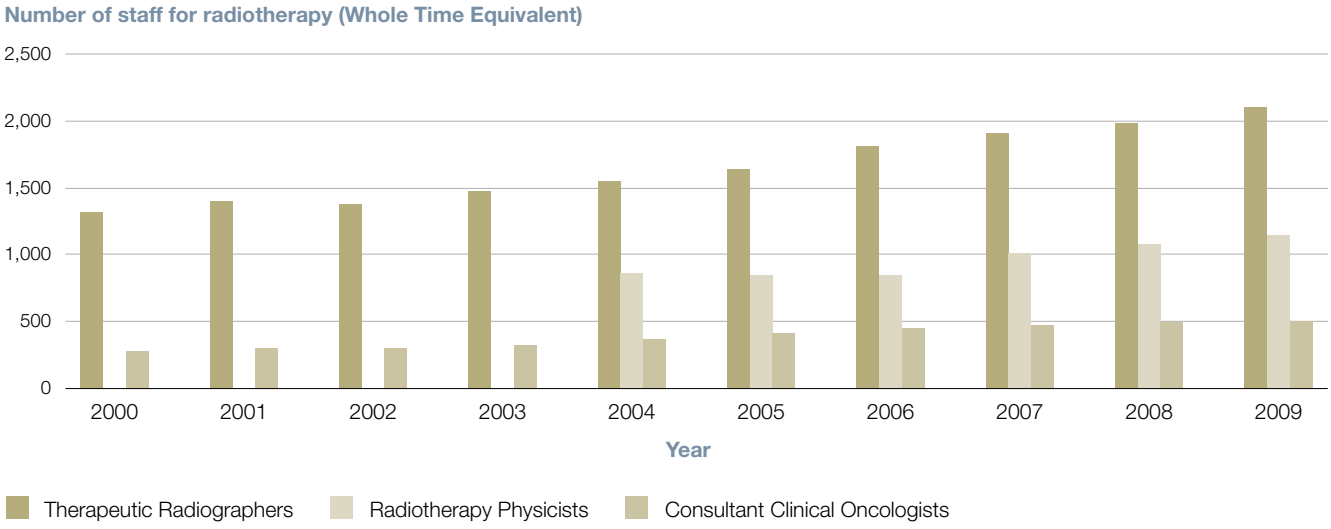
Source: NHS Information Centre

11 National Audit Office analysis of 2009 RCR survey data. Responses covered all imaging (rather than just CT and MRI).

3.15 For radiotherapy, consultant clinical oncologists have increased by 80 per cent from 279 in 2000 to 502 in 2009, whilst therapeutic radiographers have increased by 60 per cent from 1,309 to 2,097. Radiotherapy physicists have increased by 34 per cent from 857 in 2004 to 1,146 in 2009 (**Figure 18**). Despite increases in the number of linac machines, and the priority attached to increasing access to radiotherapy, a shortfall in workforce capability to deliver modern radiotherapy services remains, with vacancy rates of around 7 per cent for therapeutic radiographers. The National Cancer Action Team has also identified the risks of not having enough experienced physicists to introduce new technology and innovation.

3.16 The number of people leaving therapeutic radiographer training programmes before qualifying is falling, but is still very high. In 2007, 49 per cent of those due to qualify in 2007 left the training programme. By 2010, this figure had fallen to 33 per cent of those due to qualify in that year. Attrition rates for therapeutic radiography training are around 6 percentage points higher than for diagnostic radiography training. The Department of Health and the Society and College of Radiographers have put approaches in place to address the attrition rates from radiography training.

Figure 18
Workforce for radiotherapy treatment



NOTE
1 Data for radiotherapy physicists were not manadatory before 2004.

Source: NHS Information Centre

Part Four

Improving management of high value equipment

4.1 Our examination indicates that there is considerable variation in the extent to which trusts focus on maximising the efficiency with which their high value equipment is utilised. Our fieldwork, including case study evidence from NHS Improvement, suggests that five essential requirements need to be put in place for high value equipment to be used efficiently. These are:

- achieving the right skill mix to support throughput;
- assessing the flexibility of working patterns and opening hours;
- strong engagement between finance and clinical teams;
- using the right data to measure performance; and
- assessing design and flow to support the patient pathway.

4.2 This Part examines these five elements and provides case examples of them working in practice.

4.3 We found no established optimal performance standard for machine use; trusts had typically used waiting times as their main measure of efficiency. The lack of standardised data collection to measure machine utilisation across the NHS limits hospitals' ability to compare their performance. Sharing good machine management practice at a hospital level remains poor, although clinicians share data about machine utilisation and throughput through their clinical networks. Our visits indicated that while a number of hospitals had tried to obtain and share data across the NHS, they found it difficult to benchmark performance, in particular with trusts increasingly in competition with one another.

4.4 For radiotherapy, the Radiotherapy Dataset offers the opportunity to identify variations in performance of similar machines between trusts and cancer networks, and for the National Cancer Action Team to investigate these differences. However, no such centrally driven dataset or approach to improvement currently exists for CT and MRI scanning equipment, so there is an inconsistency in the Department's approach to improving use of equipment for radiotherapy and for scanning.

4.5 Standardisation of measurement data is a key issue for both radiotherapy and radiology. A number of trusts we visited collected their own information on throughput of CT and MRI machines, but lacked an authoritative, standardised dataset to compare it against. For radiotherapy the National Cancer Action Team is addressing data standardisation as part of its work programme. In 2007, the National Radiotherapy Advisory Group (NRAG) recommended that 8,000 fractions should be delivered per year averaged across all linacs in each centre; however, there is a lack of confidence in the usefulness of this measure. The Department has made a commitment to analyse the Radiotherapy Dataset to ensure that the metrics in the NRAG report remain meaningful and current.

Achieving the right skill mix to support throughput

4.6 For both scanning and radiotherapy, a range of staff form the teams needed to enable delivery, preparation and scanning or treatment of patients. These include radiologists, radiographers, oncologists, physicists, nurses, practitioners and other allied health professionals, and porters.

4.7 NHS Improvement has identified that demonstrating a good skill mix for imaging includes, for example, having radiographers reporting and requesting further imaging according to agreed protocols and having assistant practitioners who can be deployed across all types of scanning equipment.[12] Portering should be organised to ensure it supports a streamlined process, reducing conflicting priorities between clinical teams. **Figure 19** provides examples of how trusts have examined their skill mix.

4.8 The 2007 NRAG report recommended implementation of the four-tier skills model (developed in 1999) in all radiotherapy departments. It aims to create a better service for patients by allocating tasks by skills and encouraging a learning culture. However, the model's uptake has been limited. A 2010 audit by the Society and College of Radiographers found that just 40 per cent of radiotherapy centres had reviewed the skills and competencies required within the radiotherapy treatment pathway.

Assessing the flexibility of working patterns and opening hours

4.9 There are opportunities to improve efficiency by examining whether opening hours are sufficiently flexible and whether a better configuration of services to respond to demand can be designed, for example, by introducing shift working (**Figure 20**). Changes to the way investigations are scheduled can also have significant benefits in terms of smoothing patient journeys, and reducing delays.

12 NHS Improvement, *Radiology Success Factors*, November 2007.

Figure 19

The Leeds Teaching Hospitals NHS Trust

The Radiology Department has created a workforce formula which allows the Directorate to understand how the workforce can be flexed to meet agreed increases in commissioner demand. As part of this process, the Trust performs ongoing assessments of its staffing profile and examines what can be done by less qualified staff, allowing the agreed demand for number of scans to be met.

The Trust has also examined clinical pathways; assessing potential pathways blockages; and extended the roles of radiographers to allow for greater reporting.

University College London Hospitals NHS Foundation Trust

The Radiotherapy Directorate uses both the Institute of Physics and Engineering in Medicine and the Society and College of Radiographers workforce calculators to determine the optimal number of staff needed to operate radiotherapy equipment, based on the specification of machine and the type of treatment delivered.

Maidstone and Tunbridge Wells NHS Trust

To maximise its use of resources, the Oncology Department examined how its existing radiotherapy skill mix met the requirements for cancer treatment; whether its structure for radiotherapy training delivered the skill mix required, and whether clinical pathways supported changes to demand.

The Trust re-configured its radiotherapy workforce to include a four-tiered career framework, where assistant practitioners were responsible for providing limited treatment according to locally agreed need; advanced practitioners were responsible for delivering expert clinical practice and specialist care to patients; and consultant radiographers were responsible for providing clinical leadership within specialist areas of service.

Source: National Audit Office examination

Figure 20

East Kent Hospitals University NHS Foundation Trust

Between 2007-08 and 2008-09, demand for CT and MRI scanning services increased by 21 per cent and 37 per cent respectively, with further increases in 2009-10 of 16 and 38 per cent. This led to cost pressure from overtime payments, with the Directorate spending £1 million on overtime in 2009-10, which it was having difficulty funding.

In July 2010, the Directorate introduced extended working hours for all routine services within the Radiology Department. These hours were covered by new shift working patterns for all staff. As a result of these changes, productivity gains to the value of £785,000 were made in the period up to December 2010. A reduction in the average cost for a scan was demonstrated in the first three months following implementation, and further reduction is expected as the full impact of the new model is recognised. Other productivity measures including scans per employee and cost/income ratios have also improved since July 2010.

Barts and The London NHS Trust

Steps to maximise patient throughput have been incorporated in the Trust's plans to deliver its new build hospital. As part of this arrangement, the Trust will split its elective diagnostic scans from its emergency scans (The Royal London will now have two CTs in A&E, and two CTs and three MRI in its Imaging Department).

Source: National Audit Office examination

Strong engagement between finance and clinical teams

4.10 Trusts with a strong relationship between their finance and radiology and radiotherapy teams have a much better understanding of levels of demand within the trust and how these drive cost and revenue. This helps trusts to understand their ongoing costs, implications of new investment decisions, and how they will be financed by commissioners or other sources of funding (**Figure 21**).

Figure 21

Heart of England NHS Foundation Trust

The Trust has put systems in place to ensure that replacement of equipment is aligned to the Trust's overall business strategy together with current and future clinical needs. Quality and Governance meetings held by clinicians and business managers are used to examine the extent to which the current stock of machinery presents risks to service delivery, in areas such as downtime. Data covering current levels of capacity, projected demand and clinical risk are reviewed by the Radiology Directorate and escalated as appropriate to the Capital Prioritisation Group, where decisions about replacement are evaluated against wider Trust objectives.

The Leeds Teaching Hospitals NHS Trust

Early engagement of clinical staff within the PFI negotiation process enabled the Trust to ensure that replacement equipment would be future-proofed to meet clinical need. A multi-disciplinary group worked with the PFI company early on in the contract negotiation process to ensure that any future replacement equipment provided would exhibit the equivalent level of technological functionality when comparing it with what was available in the market.

Source: National Audit Office examination

Using the right data to measure performance

4.11 Trusts need to have and understand their service data in particular data about daily demand and capacity; and whether capacity is available at times which match demand (**Figure 22**). NHS Improvement[13] has highlighted that radiology departments are used to monitoring activity and waiting times, but these data alone give little indication of efficiency or effectiveness. Collecting and using data appropriately will enable benchmarking, highlighting of bottlenecks in flow, and matching of capacity and demand. Key data which trusts should monitor and make available to staff and commissioners include:

- daily demand and capacity of the service;
- referral rates, referral date, imaging or treatment date, report date (turnaround times);
- imaging and reporting data; and
- waiting time profiles, number of patients waiting week by week.

13 NHS Improvement, *Service Improvement for Radiologists*, November 2007.

Figure 22

Great Western Hospitals NHS Foundation Trust

Between 2003-04 and 2007-08, demand for CT scanning in the Trust had increased by 92 per cent, and the Trust was exploring options to purchase an additional CT machine.

The Trust carried out benchmarking to understand demand for CT scans locally and to compare utilisation of its existing machine with similar radiology departments, using clinicians' networks to gather data. Results indicated that CT throughput for the Trust in 2008-09 was double that of its counterparts, indicating that the Department was operating efficiently. However, the Trust estimated further increases in activity by 2011-12 and its analysis informed the timescale for the Trust's decision to purchase an additional CT machine.

University College London Hospitals NHS Foundation Trust

The Radiotherapy Department collects a wide variety of data to manage the utilisation and performance of linac machines, with throughput data collected on a weekly basis, and 'live' time during which linac machines are switched on monitored on a daily basis. The Directorate sets utilisation targets for linac machines on a yearly basis on the basis of its analysis.

The Christie NHS Foundation Trust

The Trust uses measurement of uptime and downtime to manage the utilisation rates of its two MRI and two CT machines; aiming to achieve an uptime rate of 95 per cent within its core 8-5 hours Monday to Friday.

Source: National Audit Office examination

4.12 For many trusts, cost information for scanning and radiotherapy services is very poor. Foundation Trusts are focusing more on service line reporting, which identifies the actual cost of services, but we found that trusts do not always know if their high value machines are a generator of revenue or a driver of costs. Without such information trusts are not well placed to assess the efficiency or cost-effectiveness of services, or their affordability over time. There is a lack of incentive for trusts to improve data about costs since costs of procedures can be recovered as part of a broader tariff which relates to many different patients and specialties. Block contracting is still commonly used for scans and for radiotherapy, but this approach to funding often bears little relation to actual demand.

4.13 The Department's January 2011 Cancer Strategy aimed to accelerate the development of a range of tariffs to incentivise high quality, cost-effective radiotherapy services (see paragraph 3.9).

Assessing design and flow to support the patient pathway

4.14 Trusts should evaluate their patient pathway to check that scanning equipment and radiotherapy equipment are kept in use for the maximum possible time whilst staff are present and equipment is ready for use (**Figure 23**). This includes, for instance, at the preparation stage having a separate room where patients can change and be prepared for their procedure. For MRI and CT scanning many patients need to have an injection of contrast agents to show up parts of the body, and carrying out this preparation outside the room where the scanning equipment is located helps to minimise equipment downtime. Similar approaches to preparation of patients are relevant for improving flow of patients for radiotherapy treatment. The Department is updating its radiotherapy 'building notes' for publication in April 2011.

4.15 The National Imaging Board in its best practice guidance has set out reporting time standards, which should be achievable 90 per cent of the time. Slow turnaround times for reporting scans will delay patient treatment and therefore increase costs. Other key clinical working practices include separating the role of image capture and image reporting, to smooth the flow of patients through the scanner by radiographers and provide reporting time for the radiologist; and establishing protected, uninterrupted reporting time as standard.[14]

14 NHS Improvement, *Radiology Success Factors*, November 2007.

Figure 23

St Helens and Knowsley Teaching Hospitals NHS Trust

The Trust recognised that timely reporting of imaging results made a vital contribution to reducing length of stay whilst also enabling the Directorate to plan the scheduling of outpatient scans more effectively.

To ensure reports were delivered promptly the Trust extended the role of advanced practitioners so that they could perform electronic vetting[1]. Radiologists were also encouraged to use a 'pooling' system, which aimed to share the vetting of non-specialist cases across the most appropriate clinical staff. Lastly, the Trust instituted a system where clinical reporting was dealt with by patient waiting times, and not by modality. The Trust now completes 95 per cent of reports on the same day or next day, in line with National Imaging Board best practice. Furthermore, 99 per cent of reports for all modalities are completed within two days.

King's College Hospital NHS Foundation Trust

The Radiology Department operates a wait-based model to measure machine performance. For CT and MRI, information about the length of time a patient waits for scanning is collected for both in- and outpatients. The Department aims to achieve a 24 hour waiting time for inpatients and a 14 day wait for outpatients. In 2009-10, 85 per cent of all CT patients received a scan within two weeks of referral.

London NHS Diagnostic Service

The service was launched in 2007, offering GPs and other healthcare professionals direct access to diagnostic and imaging scans and tests throughout London from mobile, fixed and community-based facilities. The service allows GPs to refer patients directly for diagnostic tests without traditional outpatient appointments, with patients seen within 13 working days after referral. Diagnostic reports are sent to GPs within four days of the appointment.

Use of R-PORT by Barking, Havering and Redbridge University Hospitals NHS Trust

The national radiotherapy capacity planning tool (R-PORT) was designed by the National Cancer Action Team to help model business planning from different use of resources, to ensure service improvement, and identify appropriate investments in radiotherapy service delivery.

Agency radiographers were employed by the Queen's Hospital radiotherapy service to ensure waiting times were managed while the Trust was seeking to justify unfreezing eight radiographer positions. The tool confirmed that the main bottleneck leading to delays in the patient pathway was caused by a lack of available appropriately trained radiographers. R-PORT enabled the team to simulate the potential staff and skill level needed in each area and to identify ways to maximise efficiency. The findings were used to support a business case, resulting in releasing four radiographer posts, reducing inefficiencies, improving throughput, and meaning that the service is no longer heavily reliant on agency staff.

NOTE

1 Vetting is the process by which the radiology department decides whether or not to accept a patient for a procedure.

Source: NHS Improvement, National Audit Office examination, London NHS Diagnostic Service and National Cancer Action Team

Appendix One

Methodology

Our fieldwork took place in December 2010 and January 2011.

Method	Purpose
Review of policy documents, academic literature and departmental data	To develop understanding of the history and landscape for NHS capital equipment and identify data for our analyses.
Analyses of existing data	To identify the number, age and specification of machines, waiting times, unit cost per scan, fixed costs, and workforce. We also collected data on opening hours of MRI and CT units from trusts.
Analysis of costs and efficiency	To examine variations in cost and unit costs of scanning we reviewed the Department's reference cost database, and for radiotherapy the Radiotherapy Dataset. We also carried out regression analyses on an extract from the Radiotherapy Dataset to investigate reasons for variation in linac machine throughput.
Visits to NHS acute trusts	To understand practical issues faced by trusts and to identify good practice in planning, managing and using MRI, CT and linac machines, and how to improve utilisation, we visited 13 NHS trusts interviewing the Finance Director, business managers, clinical teams (radiologists, radiographers, oncologists). We also reviewed data and case examples provided by these trusts.
Semi-structured interviews with stakeholders including the Department, Health Protection Agency, National Cancer Action Team, the Royal College of Radiologists, the Society and College of Radiographers, NHS Improvement, NHS Supply Chain	Qualitative analysis, identification of data sources and reports to understand the context of developments in utilisation of high value equipment, and to identify how utilisation can be improved.
Expert Panel	To provide feedback, comment and context on our emerging findings and presentation of data.

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