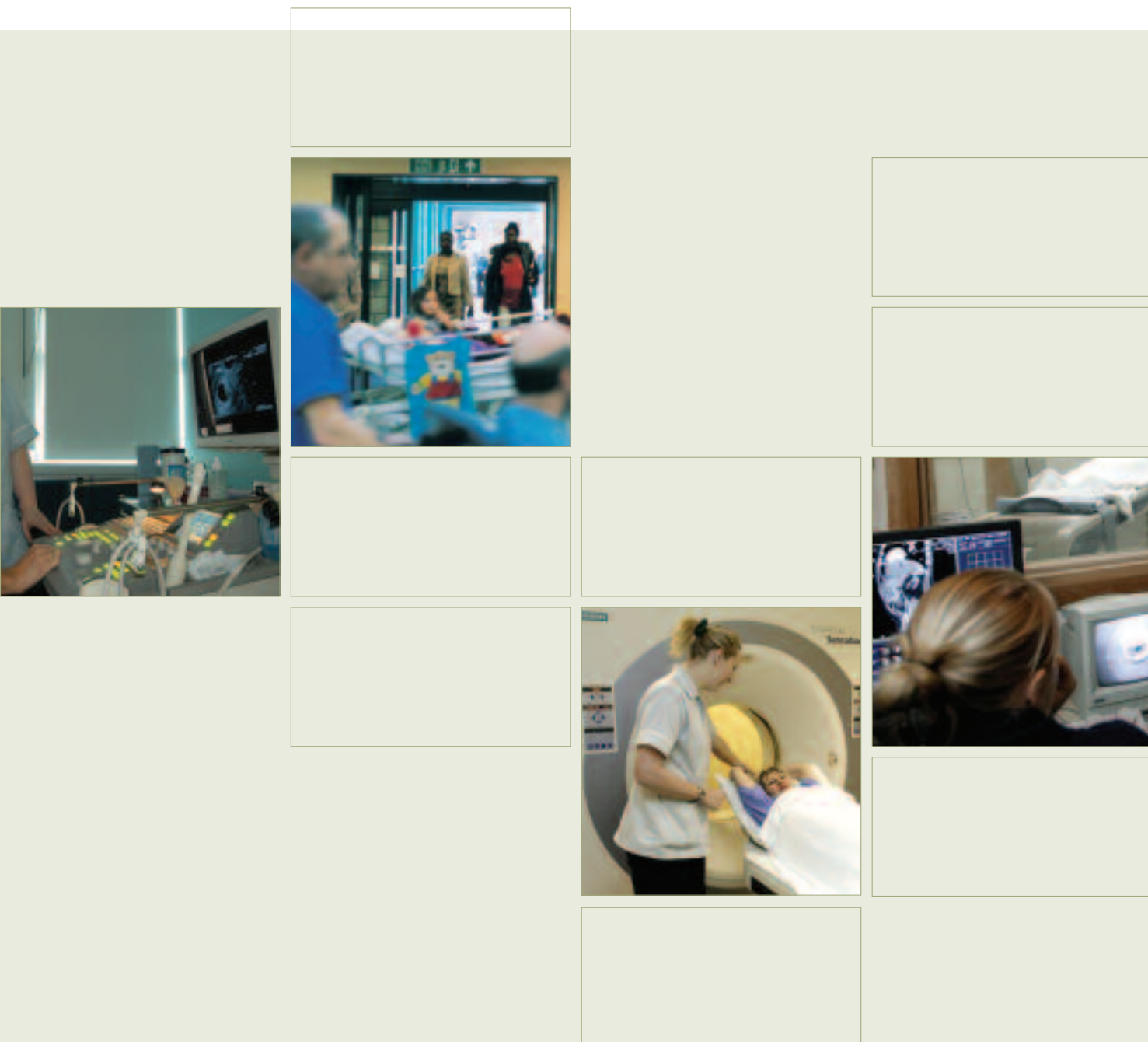


An improving picture?

Imaging services in acute
and specialist trusts



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Contents

Executive summary	3
Introduction	7
Perspectives of people who use imaging services	13
What do referring clinicians think of imaging services?	13
Reducing waits	15
Mode of reporting	21
Availability of services	21
A child-centred service	23
Listening to those who use services	24
Demand and capacity	25
Rates of referral	25
Reviewing processes and planning business	26
Equipment	26
Departmental management and efficiency	30
Staff in imaging departments	30
Unit costs	34
Use of information technology	35
Monitoring management data	37
Conclusions and recommendations – the way forward	39
Appendix: Weightings used when calculating productivity	41

The Healthcare Commission

The Healthcare Commission exists to promote improvements in the quality of healthcare and public health in England. We are committed to making a real difference to the provision of healthcare and to promoting continuous improvement for the benefit of patients and the public. The Healthcare Commission's full name is the Commission for Healthcare Audit and Inspection.

The Healthcare Commission was created under the Health and Social Care (Community Health and Standards) Act 2003. The organisation has a range of new functions and took over some responsibilities from other Commissions. It:

- replaces the Commission for Health Improvement (CHI), which ceased to exist on March 31st 2004
- takes over functions relating to independent healthcare previously carried out by the National Care Standards Commission, which also ceased to exist on March 31st 2004
- carries out the elements of the Audit Commission's work relating to the efficiency, effectiveness and economy of healthcare

We have a statutory duty to assess the performance of healthcare organisations in the NHS and award annual ratings of performance, to coordinate inspections and reviews of healthcare organisations carried out by others, and register organisations providing healthcare in the independent sector on an annual basis.

We have created an entirely new approach to assessing and reporting on the performance of healthcare organisations. Our annual health check will examine a much broader range of factors than in the past, enabling us to report on what really matters to patients and the public.

Executive summary

This report presents the key national findings of an acute hospital portfolio* review of imaging departments (also called radiology departments) in acute and specialist NHS hospitals in England, which the Healthcare Commission carried out in 2005/2006. This was one of the components of an integrated review of the three main diagnostic services, the others being pathology and endoscopy.

Much of the data that we collected for this review was also collected by the Audit Commission during its acute hospital portfolio review of radiology carried out in 2001. This enabled us to assess the progress made by trusts over the intervening period, as well as to compare their current performance.

The greatest challenge facing all diagnostic services at the present time is to help trusts meet the Government's target of a maximum wait for patients, by the end of 2008, of 18 weeks from referral to the start of their treatment. The Department of Health set a milestone that by March 2007 no patient should wait for more than 13 weeks for a diagnostic test. During the past year most trusts have made remarkable progress in eliminating long waits, but there are a minority of imaging departments for whom meeting the 18-week milestone will be a major challenge.

The challenge is all the greater because of a rising number of referrals. Nationally, the number of computed tomography (CT) scans has been growing by 15% each year, the number of magnetic resonance imaging (MRI) scans by 11% a year and ultrasound scans by 5% a year. There are major uncertainties about the future shape and size of diagnostic services in acute trusts, with growing pressure for much

of their core work to be relocated to community settings that are closer to the patient.

Our review sought to provide each trust with a clear picture of how its imaging departments were performing so as to inform service level agreements and decisions on the reconfiguration of services.

Auditors have already agreed local findings and recommendations for action with each NHS trust. In March 2006, we distributed comparative data and presentation software to enable trusts to identify and prioritise areas for improvement. We also used the review's top-level performance indicators in our annual health check assessment of the provision of diagnostic services by each trust, which we published on August 25th 2006.

Key findings

There have been significant improvements to imaging services since the Audit Commission carried out the last acute hospital portfolio review in 2001.

Waiting times have been reduced in many parts of the country. For example, between 2001 and 2005, typical waits for CT scans referred by a GP or outpatient department were reduced by a third from seven to five weeks, and those for MRI scans from 21 to 14 weeks. The Department of Health's recent monitoring data is also encouraging. It suggests that remarkable further progress was made by many trusts during 2006 in eliminating waits that exceeded 13 weeks.

Many imaging services were available for more hours each week than in 2001: 14% of trusts

* A collection of reviews of key services, resources or issues of national concern and importance to patients, NHS trust managers and clinicians. From 2007 it will become part of a programme of service reviews. More information is available on our website: www.healthcarecommission.org.uk/acutehospitalportfolio

provided open access or GP-referred plain x-rays for 60 or more hours a week, including 30 departments that opened at the weekend.

The proportion of imaging examinations that were never formally reported (and where there was no formal agreement that the requesting clinician would write the report) had fallen from 13% to 9.5%. The reporting of imaging examinations requested by less experienced doctors in accident and emergency (A&E), or by a GP who would not be able to view the image, is particularly important. Increasingly this reporting is carried out by a radiographer, leaving radiologists to focus on more complex work.

The 2001 review found that much of the imaging equipment in use was old, with limited capacity, causing long waits for examination. By 2005 there were 39% more MRI scanners, 23% more CT scanners and 22% more ultrasound machines. Less of the equipment in use had exceeded its recommended lifespan – the percentage of CT scanners over seven years old had fallen from 33% to 15%.

The productivity of staff had increased in many departments, with many staff also taking on a wider range of extended roles. For example, each radiographer performed 5% more weighted examinations (see Appendix) in 2005 than in 2001.

Fifty-three percent of imaging departments had some form of picture archiving and communications system (PACS), compared with only 13% in 2001. The NHS' Connecting for Health Programme aims to provide access to PACS at all NHS locations by March 2007. This should further improve the speed and quality of reporting.

However, there is still significant room for improvement.

Unacceptable waits still exist, which are of concern to both patients and clinicians. Despite the substantial progress that has been made in reducing waiting times, in December 2006, there were still six trusts that had more than 100 patients who had waited for more than six months for a scan.

In many trusts, images were reported no faster than they were in 2001: two out of every three clinicians in trusts disagreed with the statement "radiology reports are always available by the time that we need them". Slow reporting may result in longer hospital stays. Also, at the slowest 5% of trusts, the average time from examination of a patient at the request of a GP to dispatch of a report was 12 days or more, which could delay referrals for treatment.

Fifty-two percent of imaging departments that examine children did not have a consultant or advanced practitioner with responsibility for paediatric radiology; three out of five departments did not have protocols for the safe immobilisation of uncooperative children.

There are major differences between trusts in rates of referral for imaging: one in 10 imaging departments receives more than 615 referrals from A&E for every 1,000 A&E attendances, while the same proportion of imaging departments receive fewer than 308 referrals for every 1,000 A&E attendances.

The provision of imaging equipment varies in different parts of the country: there were only 14.6 non-obstetric ultrasound machines for each million people in the East of England region, but 24.8 in the Yorkshire and the Humber region.

There appear to be wide variations in productivity and unit costs, which cannot be explained by differences in the size of departments or in the complexity of work that they carry out. Radiographers in some hospitals performed more than twice as many examinations each year (after taking account of the complexity of case mix) as those in others.

Recommendations

Despite the improvements made since 2001, our review has highlighted areas that would benefit from adopting the following recommendations.

Nationally:

- there is an urgent need to standardise the way that imaging activity is counted. There is also a need to revise weightings that recognise the differing requirements for resources of each type of activity; this will facilitate the introduction of tariffs and enable equitable comparisons to be made of value for money across the NHS and with the independent sector
- the clinical justification for the major differences in referral and request rates for imaging across the country and between hospitals should be examined critically with a view to spreading best practice on the circumstances in which particular examinations are requested

Imaging departments, with their trusts' management and commissioning primary care trusts (PCTs), should:

- complete analyses of capacity and demand and use them to inform planning and to agree funded programmes for procurement

and replacement of equipment

- increase the proportion of imaging activity covered by service level agreements
- consider the impact of all decisions about major development of services upon the workload and expenditure associated with imaging
- ensure that reasons for all abnormally high or low productivity or unit costs are understood and justified and that action is taken to reduce unexplained variation. This may require a further review of the workforce, of the mix of skills in the light of changes in demand, and of roles, equipment and processes. It may also require a review of the continuing need for retaining under-used services in satellite locations. Meanwhile, exceptionally high workloads may prompt a review of referral patterns or an audit of the justification for high numbers of requests, as well as a re-examination of roles
- make full use of the investment made in IT systems, such as PACS, digital dictation and voice recognition software, and electronic booking and reporting systems

A minority of trusts and their commissioning PCTs need to increase their efforts to reduce the number of patients waiting for more than 13 weeks for some types of scan. To help them do this, they should assess:

- their processes for managing waiting lists
- the number of separate queues that they have for the same type of examination
- their opening hours and whether, if required, extra funding could be agreed with PCTs to enable complex scanners to be run for additional hours

- the way that patients move through the department
- whether the roles of radiologists, radiographers/ultrasonographers and support staff reflect the current needs of the department and the mix of staff that it employs
- whether some examinations or reporting should be re-allocated to other NHS providers, or to the independent sector

Clinicians should:

- ensure that formal agreements are put in place as to who will report different types of examination (according to the source of referral) and within which target timescales, in order to meet clinical needs

Introduction

Imaging departments (sometimes still referred to as x-ray or radiology departments) in acute and specialist trusts in England carry out about 33 million examinations of patients each year. These include radiological examinations, such as x-rays and computed tomography (CT) scans; other diagnostic scans, including ultrasound examinations and magnetic resonance imaging (MRI) scans and a variety of interventional procedures guided by scans.

Some imaging departments also perform nuclear medicine examinations, such as positron emission tomography (PET) scans, although in the larger trusts these are often the responsibility of a separate department. Forty-five per cent of the imaging departments that we studied also have responsibility for cardiology catheter laboratories, but these services are outside the scope of this report. Our review also excluded radiotherapy.

Plain x-rays* still account for 62% of the examinations carried out by imaging departments (see table 1), but because they are relatively simple to do, they are responsible for only a fraction of the workload of these departments. The major areas of growth are CT scans (which have been growing on average by over 15% each year since 2001), MRI scans (growing by over 11% each year), and ultrasound scans (growing by 5% each year). Interventional work is also growing rapidly, but still forms a small percentage of the total. Of all the types of examination studied by our review, only the number of barium studies** has decreased (see figure 1). This is because better alternative examinations have become available for some patients.

Table 1: Imaging examinations by modality (type of examination)

	% Exams
Plain x-rays	62.8%
Ultrasound	18.5%
CT	7.8%
MRI	3.0%
Mammography	1.7%
Nuclear medicine	1.5%
Barium studies	1.0%
All other	4%

A&E and inpatient wards each make almost a quarter of all requests for imaging, while outpatient clinics (particularly orthopaedic clinics) make over a third. Most of the remaining requests comprise direct referrals by GPs. Some imaging departments also have referrals from other hospitals, often for complex examinations that are not available in all trusts, but these represent just 1.2% of the total (see table 2).

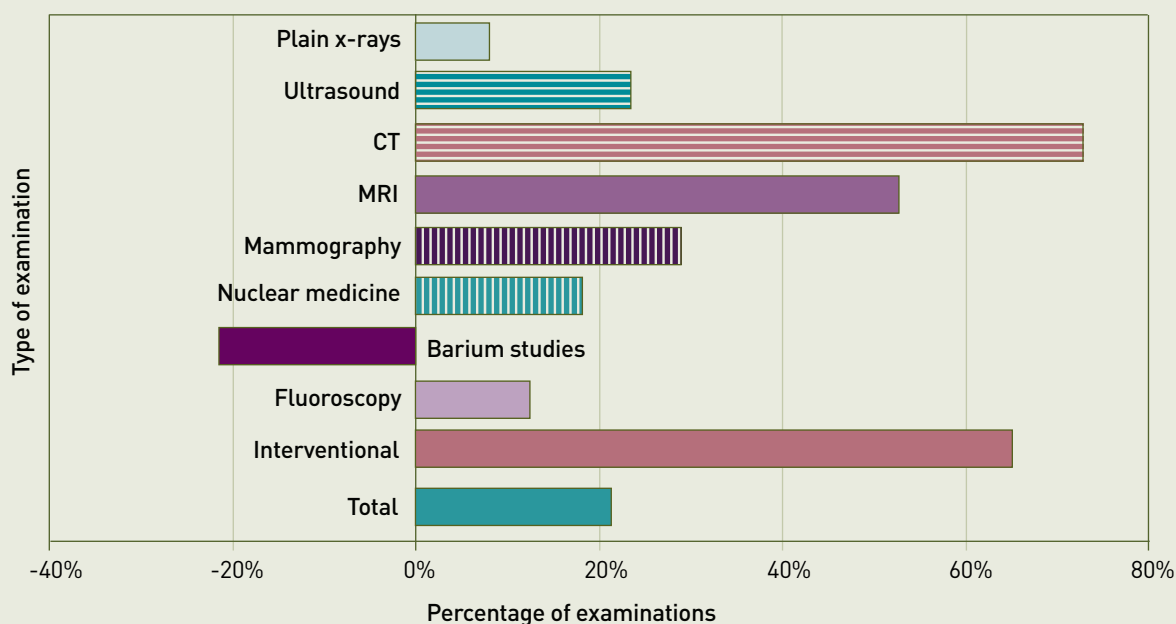
Imaging departments examine a diverse range of patients, whose medical problems range from sprains and simple fractures to life-threatening conditions such as suspected heart attacks and cancers. Some interventional radiology procedures are for the treatment of conditions that in the past would have required surgery.

The substantial benefits of modern imaging for the care of patients come at a significant cost –

* Mobile, theatre and dental x-rays if carried out under the auspices of the radiology department. The figures shown for ultrasound include obstetric as well as gynaecological and general ultrasound.

** Radiological investigations of the stomach or bowel using a radiopaque barium sulphate swallow or enema as a contrast medium.

Figure 1: Change in number of examinations between 2001 and 2005



Source: Audit Commission/Healthcare Commission acute hospital portfolio data collections
 Periods: April to September 2005 (figures doubled for annual estimate) compared with April 2000 to March 2001

the capital cost alone of the latest scanners exceeds £1.5million for each machine. The combined budgets of the imaging departments examined in this report (excluding major capital expenditure and some trust overheads) were £1.25 billion in 2005/2006, of which about

three-quarters was taken up by costs relating to staff.

At the time of our review, imaging services were provided by:

- 2,941 radiologists* – these are doctors (two-thirds of whom are consultants) who advise on appropriate examinations, carry out the most complex procedures, interpret images and oversee clinical aspects of the service
- 11,829 radiographers and ultrasonographers – these are graduates who carry out the majority of imaging examinations, as well as performing a growing range of extended roles and managing the day-to-day running of the department
- 828 qualified nurses, as well as 2,307 technical staff, clinical physicists (who

Table 2: Imaging examinations by type of referral

	% Exams
A&E	22.0%
Admitted patients	22.4%
Outpatients	36.1%
GP referrals	18.4%
Tertiary and other referrals	1.2%

* Whole time equivalent staff in post plus locums.

carry out nuclear medicine examinations), and care assistants

- 5,377 administrative and clerical staff

This is one of three reports on diagnostic services to be published by the Healthcare Commission in 2007. The other two reports concern pathology and endoscopy services. Of these three diagnostic services, imaging has been the most tightly regulated, owing to the potentially harmful effects on patients of ionising radiation if it is used inappropriately. It is also perhaps the diagnostic service that most patients are familiar with.

The key challenge facing all providers of diagnostic services at present is to meet the Government's target that, by the end of 2008, patients should face a maximum wait of 18 weeks from referral to the start of their treatment. There are also more stringent 61-day targets for patients with suspected cancers. To achieve these targets, the Department of Health also set primary care trusts (PCTs) the milestone of ensuring that, by March 2007, no patient has to wait more than 13 weeks for a diagnostic test. This has been a major challenge for many trusts, as previous reviews have reported long waits for some types of scan.

These improvements must be delivered at a time when there are major uncertainties about the future shape of diagnostic services in acute trusts. The introduction of payment by results, initiatives concerning choice for patients, practice-based commissioning and policies that encourage the growth of diagnostic and treatment facilities in the independent sector all make the future stability of the funding of imaging services more uncertain. Meanwhile, many of the plain x-rays that are currently the core activity of imaging departments could be relocated to larger GP surgeries or other

community settings. Such potential changes make it imperative that each trust has a clear picture of how imaging services are performing to inform service level agreements and decisions on the reconfiguration of services.

About this report

This report follows two previous reports on radiology by the Audit Commission. *Improving your image*, published in 1995, was followed up by a report of national findings from an acute hospital portfolio review of radiology, published in 2002, which was based on data for the financial year 2000/2001. That review found that in some hospitals:

- there were long waits for examinations (other than for general x-rays), which slowed a patient's diagnosis and treatment
- many examinations were not reported, or there were long waits for reports to be made available to the referring clinician
- much equipment was older than the maximum recommended age

This report relates to the Healthcare Commission's 2005/2006 review, which followed up these key issues and addressed current concerns. We collected data from all relevant imaging departments in NHS acute and specialist hospitals in England* during the autumn of 2005. Where possible, we used the same definitions for data as those specified by the Audit Commission in the 2001 review so that we could measure improvements as well as assess each trust's current performance against that of others. In these reviews we used the workload categories developed by Keele University. The data included the number of examinations and reports contracted out by trusts to

* Similar reviews took place in Wales and Northern Ireland but are not included in this report.

providers of services in the independent sector.* However, our review did not include scans performed outside the setting of acute hospitals.

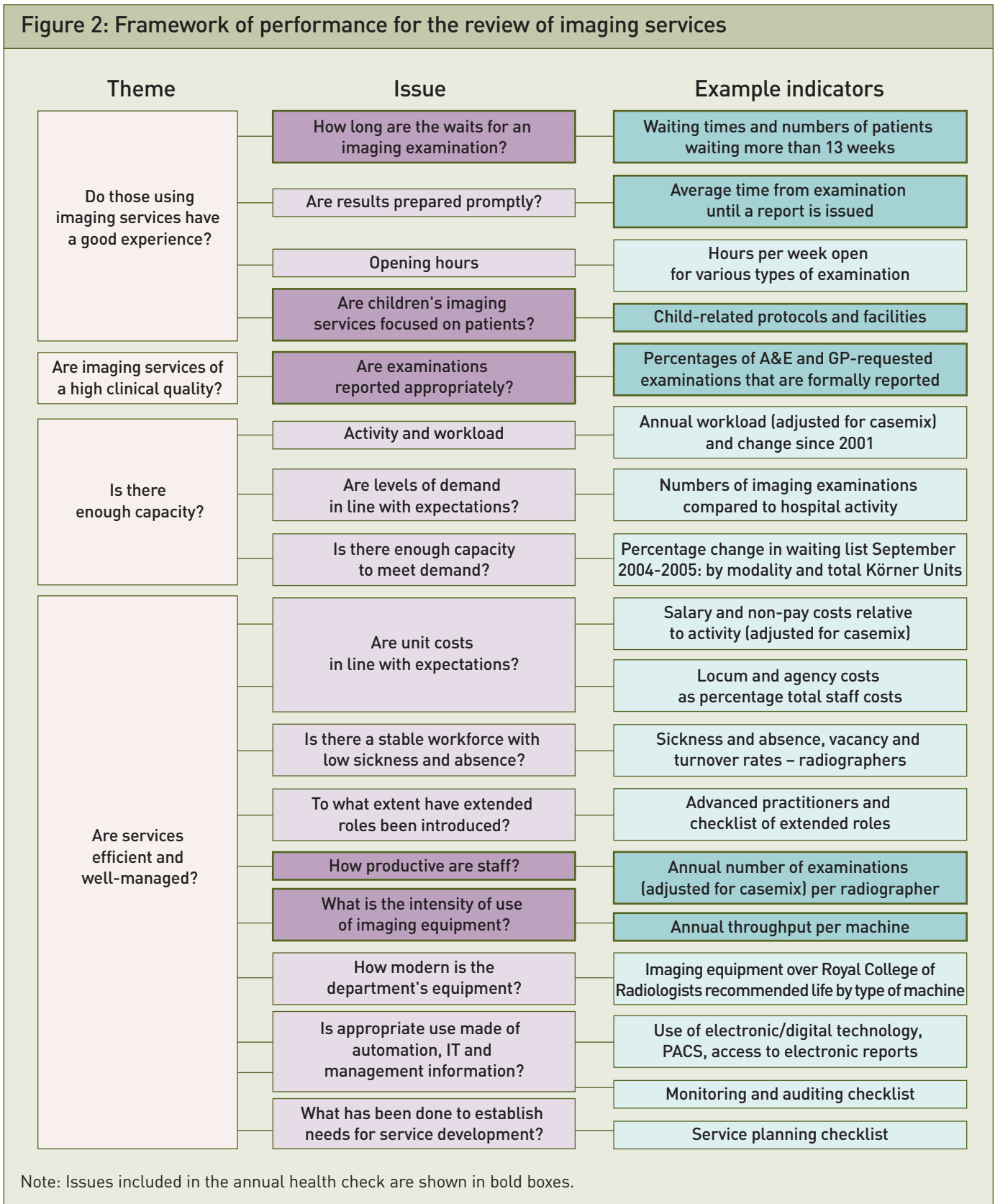
Based on the data we collected, we defined indicators and produced a framework of performance (see figure 2), databases and guidance. We used the most important indicators of performance to score trusts on diagnostic services in the annual health check for 2005/2006 (these scores were published on August 25th 2006).

This report draws on a wider set of indicators than the annual health check, including those used by reviewers appointed by the Audit Commission (working in partnership with the Healthcare Commission). These reviewers have now produced local reports for each trust based on standard templates and have agreed recommendations and action plans with them. Figure 3 shows how the issues examined by these indicators relate to a simplified pathway for patients, extending from the time that an imaging examination is requested until they are informed of the results. Since March 2006, trusts have also had access to these databases and to the 'Compare' presentation software, which enables them to compare their performance with others, and many have already used them to improve services.

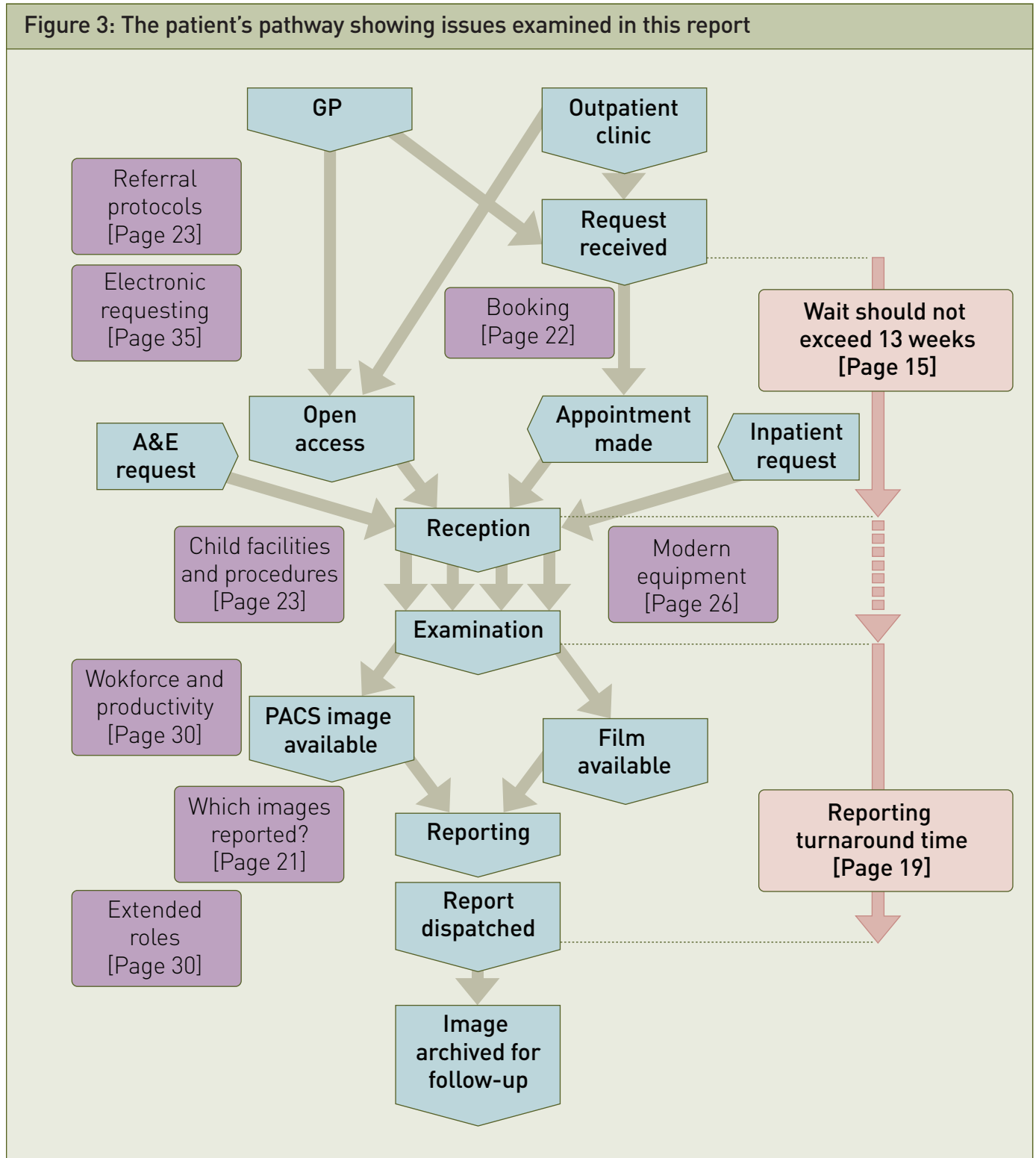
This report also draws on the Department of Health's national monitoring data that has been collected since January 2006 concerning the number of patients waiting for key diagnostic procedures at each trust and the number of examinations that they have carried out.

* For example, MRI services provided by Alliance Medical using mobile vans located on trust premises and scans reported by radiologists in remote locations.

Figure 2: Framework of performance for the review of imaging services



Note: Issues included in the annual health check are shown in bold boxes.



Perspectives of people who use imaging services

The acute hospital portfolio review of imaging departments focused mainly on how imaging services are managed, rather than on the experiences of individual patients. But it did address the questions that are of most concern to people who use imaging services, such as:

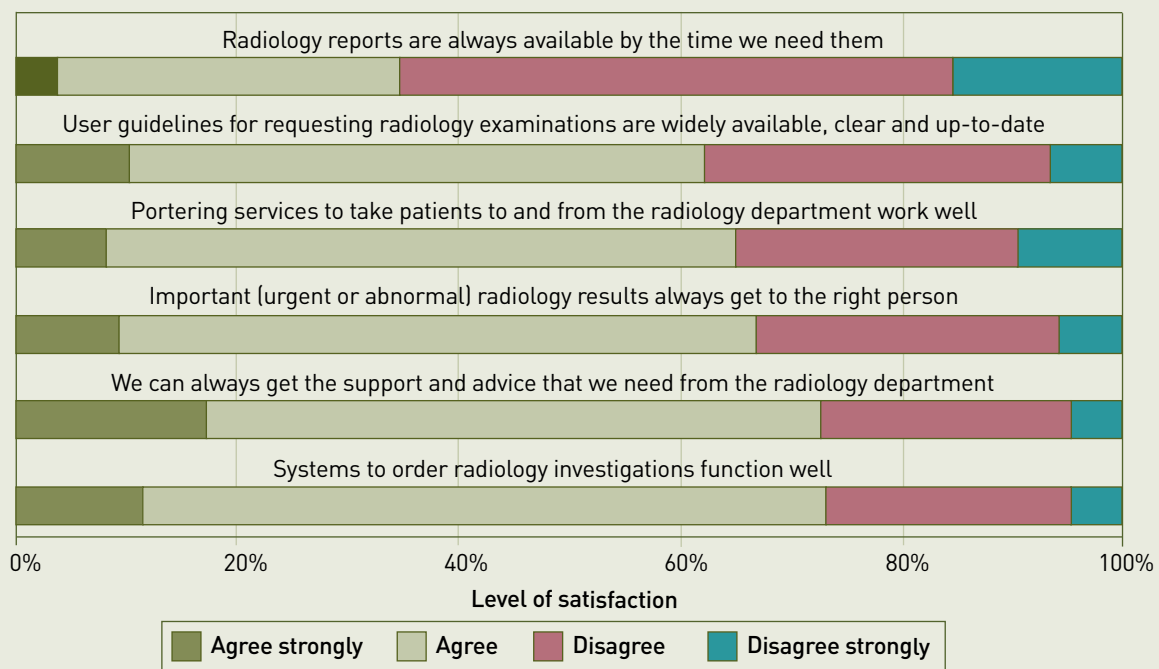
- how long must I wait for an examination and how long does it take to get the results?
- will someone with appropriate expertise interpret my results?
- how easy is it to make an appointment and will it be at a time that is convenient for me?
- how well does the department cater for vulnerable patients, such as children?
- does the imaging department value my views and act upon them?

These questions are of as much interest to clinicians making referrals as they are to patients. We were unable to conduct a survey of patients for this review, but we were able to gather the views of some clinicians. Their opinions complement the data provided by imaging departments and the data we gathered from other sources.

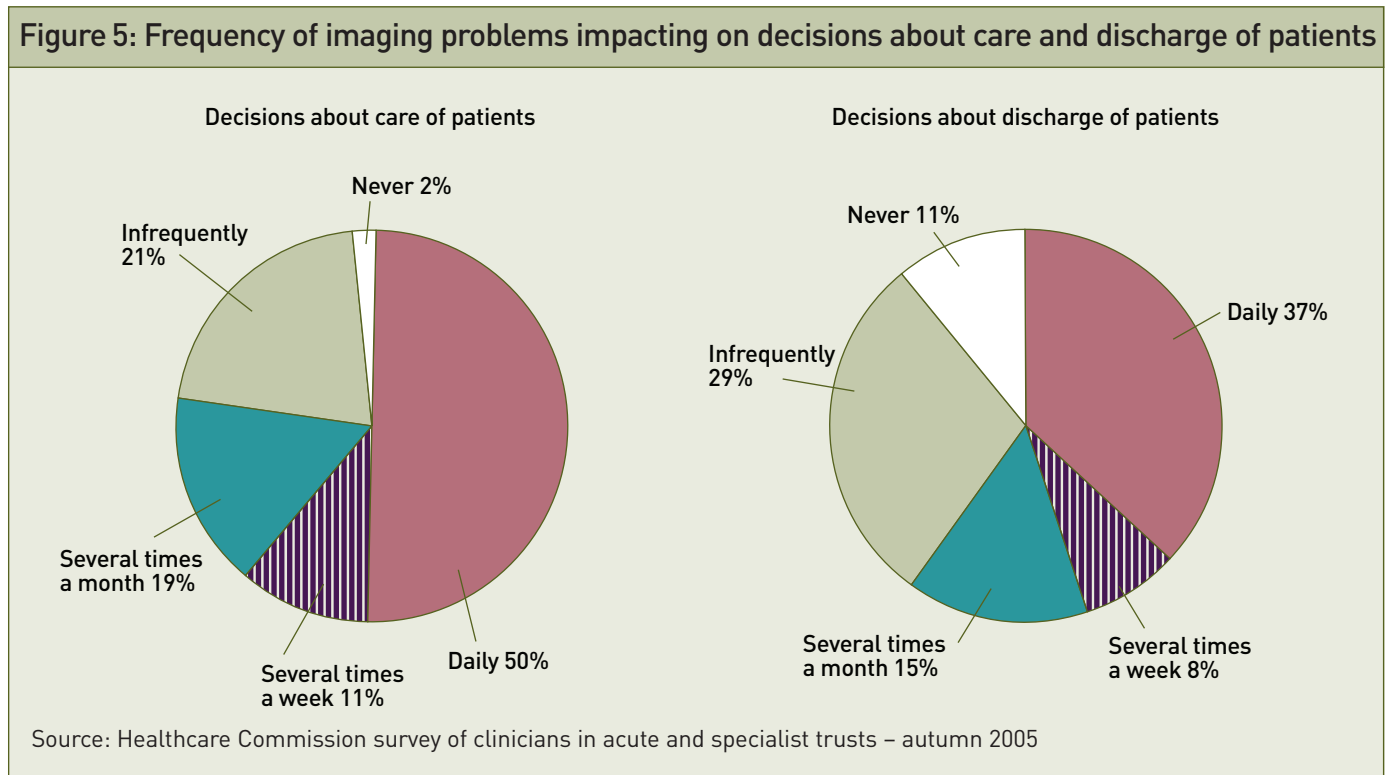
What do referring clinicians think of imaging services?

We invited clinicians in acute and specialist trusts to complete a questionnaire to get their views on the various aspects of imaging services in their trust (see figure 4). Overall we gathered the opinions of over 5,500 doctors and nurses. Unfortunately, it was not practicable to survey the views of GPs or other non-hospital clinicians

Figure 4: Clinicians' satisfaction with imaging services



Source: Healthcare Commission survey of clinicians in acute and specialist trusts – autumn 2005



who refer patients to these services.

The biggest problem reported by these clinicians was timeliness. Two out of every three respondents disagreed (or disagreed strongly) with the statement “radiology reports are always available by the time that we need them”. However, views varied widely from trust to trust*, ranging from 71% of respondents at one trust who thought that reports were always timely, to just 3% at another.

This widespread concern was reflected in responses to questions about the frequency with which problems with imaging services, of any sort, had an impact upon decisions concerning the care of patients (see figure 5). Indeed one half of respondents said that problems occurred every day. Problems can also have an impact upon delays in discharging patients: 45% said that such delays happened

at least several times a week.

It is unrealistic to think that the expectations of clinicians can always be met. However, respondents were more critical in general about imaging services than about pathology services (where just 19% of respondents said that problems such as the non-availability of test results when required delayed discharge several times a week or daily). That said, at 24% of trusts, the survey’s respondents were more critical of the timeliness of pathology results than of imaging reports.

Clinicians were far less critical of other aspects of imaging services – in particular, systems to request imaging examinations and the ability to get support and advice from the radiology department. However, 38% of respondents thought that guidelines for requesting radiology examinations were not always as widely available

* Excluding trusts with fewer than 20 respondents to this question.

to users, clear or up-to-date as they should be. The greatest variation between views expressed in different trusts concerned the availability of portering services when patients needed to be taken to and from the imaging department.

Reducing waits

Waits for imaging fall into two parts: the wait between referral and examination, and the further wait for results. Delays cause unnecessary worry and uncertainty, and sometimes delay treatment. Improvements to the timeliness of reporting and the lengths of waits are therefore as high on the agenda of patients as they are on those of clinicians.

The wait for an examination

The acute hospital portfolio review of radiology carried out by the Audit Commission in 2001 found that there were long waits for some types of examination, particularly MRI and CT scans. Since then, major investment has been made available to address this problem.

Our 2005/2006 review collected data on current waiting times using the same definitions as those specified by the Audit Commission in 2001, so that we could assess change. This data showed that average waits have been greatly reduced since 2001, as has the variation between trusts. For example, typical waits for GP or outpatient-referred CT scans have been reduced from 49 to 36 days since 2001, and those for MRI scans from 147 to 95 days. In March 2001, one in every four trusts had waits for routine MRI examinations that exceeded 36 weeks, whereas by September 2005 this had gone down to 26 weeks*. There were also reductions in average waiting times for most other types of imaging examination (see figure 6 on the next page).

Despite these improvements, there were still very long waits in some parts of the country in 2005. For example, three trusts reported the wait for an MRI or dual energy x-ray absorptiometry (DEXA) scan to be more than a year. Also, waits had not been reduced at all trusts: those for general ultrasound got longer between 2001 and 2005 at 85 out of 184 departments (see figure 7 on page 17). Even for MRI scans, reported waits got longer at one in three departments.

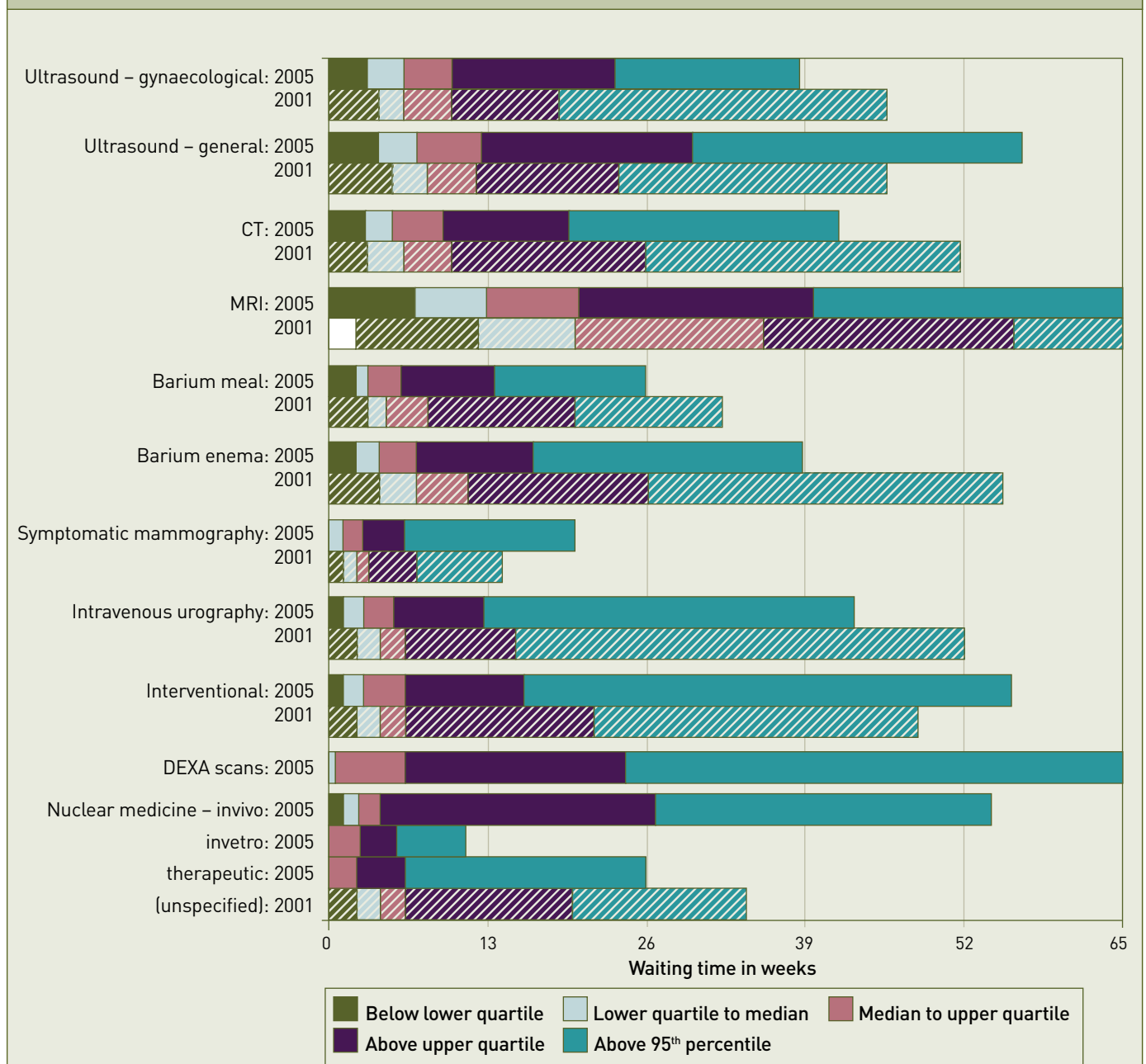
We also looked at differences in the lengths of waiting lists for different types of imaging between the beginning and end of the 12-month period that led up to September 30th 2005. Making allowance for the relative complexity of each type of examination, 36% of imaging departments ended the year with longer waiting lists than at the beginning, suggesting that problems with capacity or efficiency in those hospitals meant that they could not meet new demand. A few hospitals did not even know with any degree of accuracy how many patients were waiting. Four departments admitted to delays of a week or more before new referrals were added to the waiting list.

Meeting the Department of Health's milestone of reducing waits for imaging examinations to a maximum of 13 weeks by March 2007 is essential if the target for a maximum of 18 weeks between referral and treatment is to be achieved by the end of 2008. Since November 2005, patients who have waited for longer than 26 weeks for an imaging examination must be offered the choice of a scan at another hospital.

Until recently, no national data was routinely available on waits for diagnostic tests. However, since January 2006 the Department

* Current waits for routine GP or outpatient-referred examinations as of September 30th 2005. The current wait was defined as the number of days before two consecutive slots were available. Where waiting times for the same procedure differed according to which specialty had made the referral, the data collection form asked for a volume-weighted average of the applicable waiting times.

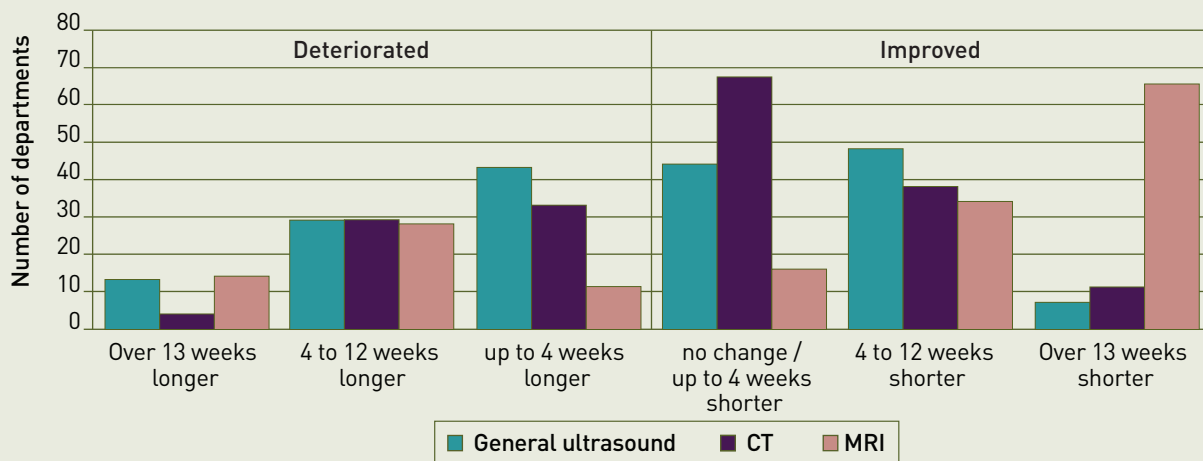
Figure 6: Waiting times for non-urgent imaging in 2001 and 2005 – performance ranges



Source: Audit Commission/Healthcare Commission acute hospital portfolio data collections. September 30th 2005 (solid bars) compared with March 31st 2001 (hatched bars).

Note: Some bars have been truncated. The maximum wait for MRI was said to be 104 weeks (150 in 2001) and for DEXA scans it was 72 weeks.

Figure 7: Change in waiting times for imaging between 2001 and 2005: local variations

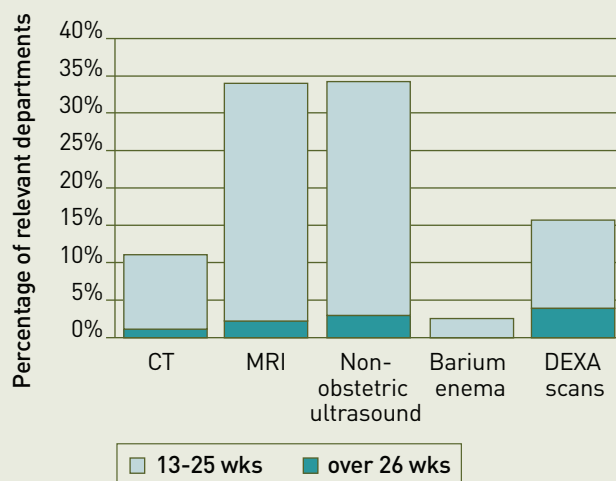


Source: Healthcare Commission/Audit Commission acute hospital portfolio data returns, 2005 and 2001

of Health has collected monthly information on imaging activity and the number of patients waiting for MRI, CT, DEXA and non-obstetric ultrasound scans, as well as those waiting for barium enema examinations. This data confirms that, nationally, the number of patients facing long waits is continuing to fall. The combined number of patients that had been waiting for 26 weeks or more for any of these five examinations fell dramatically from 16,400 to 3,070 between January and December 2006, and the number waiting for 13 weeks or more fell from over 68,000 to 25,650. Whereas in January 2006, 25 trusts had 100 or more patients who had waited for more than 26 weeks for one of these procedures, only six trusts were in this situation by the end of that year. By then, 46 trusts had already achieved the March 2007 milestone that no waits for diagnostic tests should exceed 13 weeks. This is an impressive achievement.

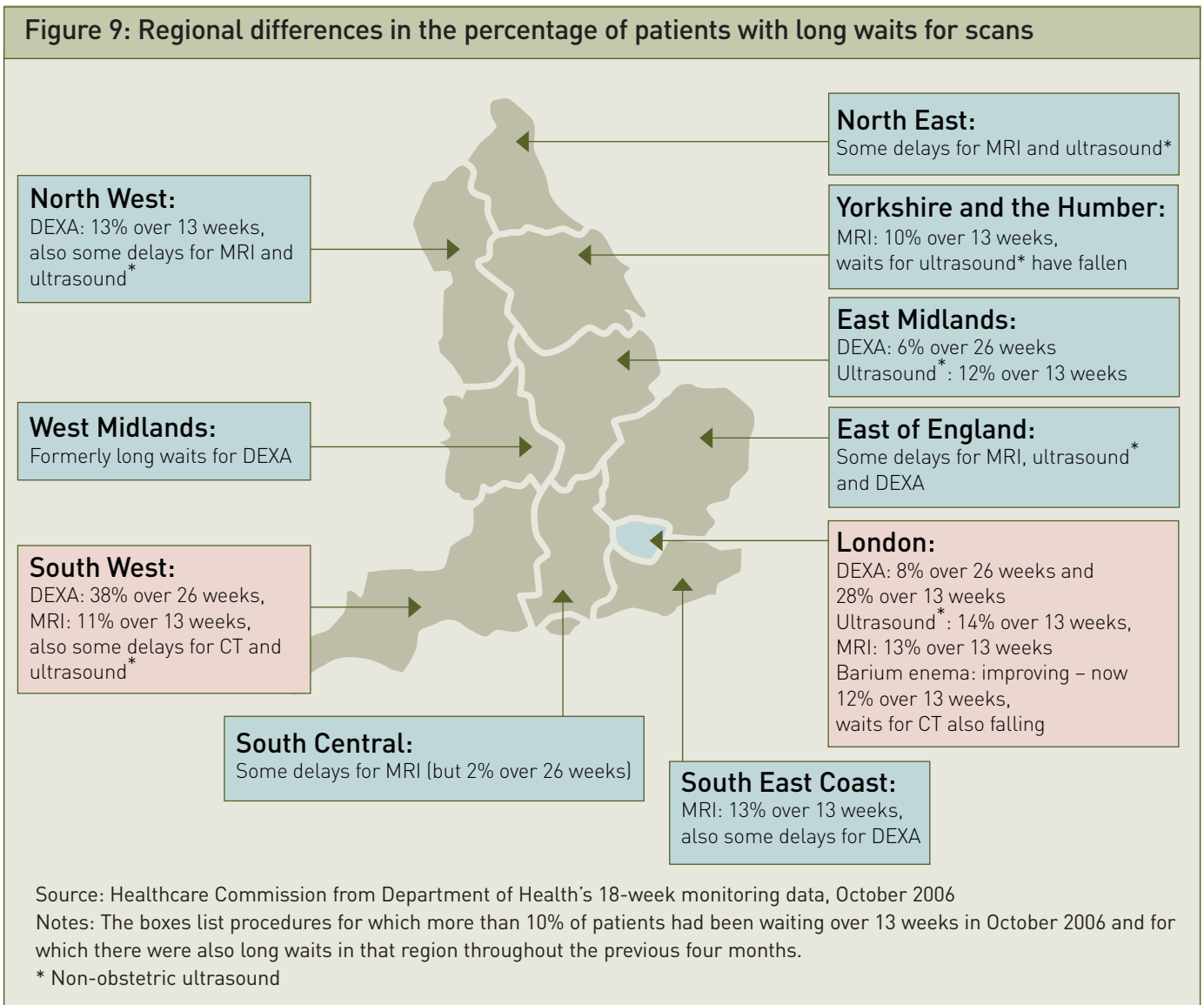
Figure 8 shows the percentages of trusts that still have long waits for each type of examination. Fifty per cent of the waits that are 13 weeks or

Figure 8: Percentage of trusts with long waits – departments with 20 or more patients waiting



Source: Healthcare Commission from Department of Health 18-week monitoring data, December 2006

longer (and almost all waits exceeding 26 weeks) are concentrated in just 6% of trusts. There is therefore little chance of keeping up the momentum of recent improvements – a



continuing reduction in the number of long waits – unless PCTs start to redirect work from the most hard-pressed trusts to other NHS hospitals or to the independent sector. The scope for such transfers within the NHS is limited, however, because there are marked regional differences in percentages of long waits. However, these differences vary by type of imaging procedure (see figure 9).

Multiple waiting lists

Some imaging departments have as many as 23 separate lists for patients waiting for an MRI scan – lists that vary according to why they were referred and by whom, the nature of the required examination and its location. The data collected for this review supports the view that waits for MRI scans are shorter at departments with fewer waiting lists because referrals for the same type of examination are combined in

one list. It also suggests that departments with fewer lists have made the greatest percentage reduction in the number of patients waiting, and shows that waiting lists for similar examinations should be combined unless there are compelling clinical reasons for prioritising one group of patients over another.

Departments with many separate queues for the same type of examination and those where the management of lists is poor are more likely to have some patients who wait much longer than the average. One in four departments reported that some patients waited for CT or ultrasound examinations for more than three times as long as their reported current waiting time. We recognise, however, that some of these long waits are not entirely within the control of a trust because procedures are sometimes deferred at the request of the patient.

The wait for an examination to be reported

Once an examination has taken place there may be a further delay before the results are made available to the referring clinician. For some types of examination (for example, a simple x-ray in a fracture clinic) it may have been agreed that a formal report is not needed. In these cases the referring clinician will have the skills to interpret the image and any short delay is unlikely to be significant. If the hospital has a PACS the image may be available to the surgeon instantly and is less likely to be mislaid than if the hospital relies on traditional films.

However, all other examinations require skilled interpretation either by a radiologist or by a suitably trained and authorised radiographer or ultrasonographer. A formal report will be prepared that will be added to the patient's notes to provide information for ongoing treatment. Formal reporting is particularly important for

patients referred by GPs, as the GP will not normally be able to view the image, and advice on interpretation is therefore always needed.

On average, it takes four days from when a non-urgent examination takes place until a report is sent to the GP by the imaging department. Despite improvements in IT and other technology, this average hasn't changed since 2001 (see figure 10). Also, as in 2001, there is still considerable variation between trusts. One in four imaging departments took an average of more than six days to send a report to the GP, and the slowest 5% said that the average time was 12 days or more.

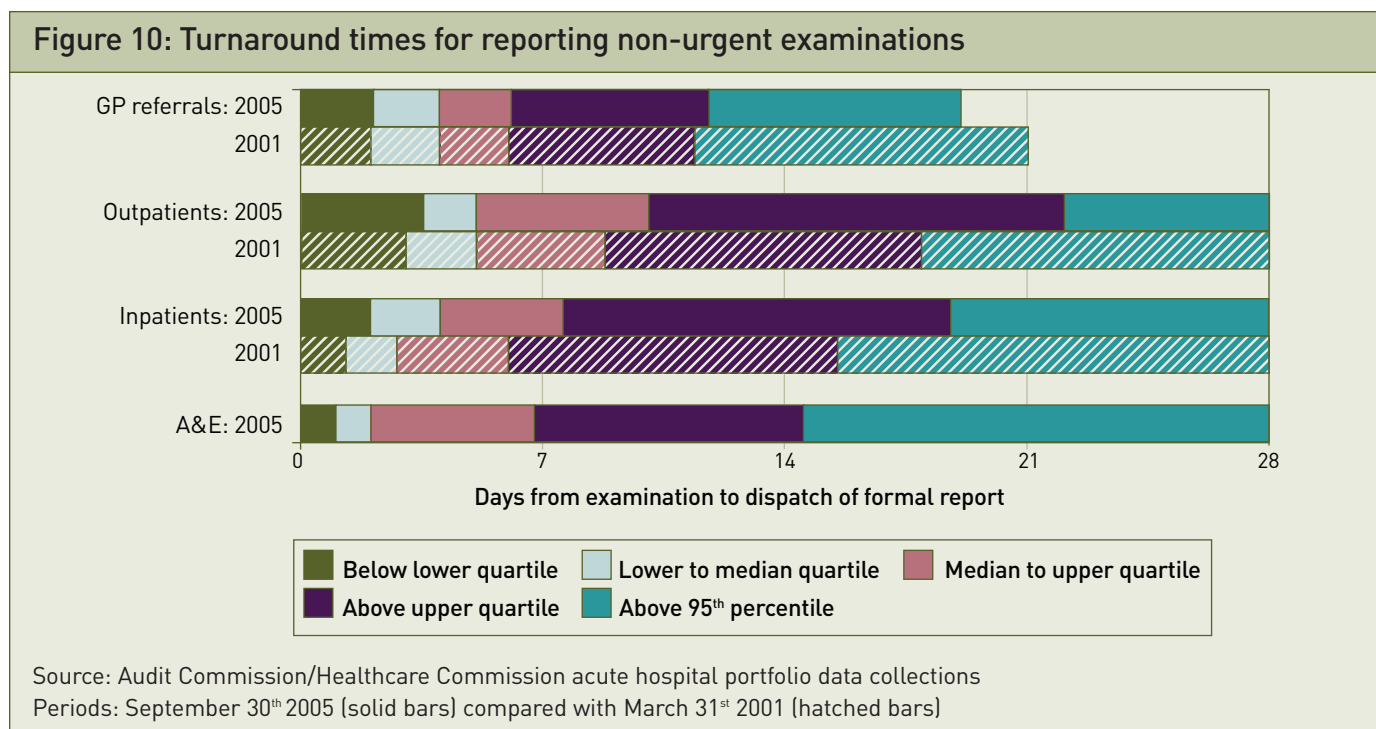
While we recognise that undue haste could compromise the quality of reporting, such long delays are clearly detrimental to the care of patients. If abnormalities had been found they may, of course, have been brought to the attention of referring clinicians before the formal report was issued.

Timely reports are also vital for A&E patients. Many imaging requests from A&E are made by relatively inexperienced doctors who need advice from experienced radiology staff to help them make decisions as to whether to admit or discharge a patient. A report may also identify a problem that was missed during the A&E examination, making it necessary to recall a patient who had already been discharged.

Our review found that most non-urgent A&E examinations were reported within two days*. However, one in four trusts took a week or more, and the slowest 5% of trusts took over two weeks. This is an unacceptable delay in cases where a patient has been sent home with an undiagnosed problem.

The time needed to produce a formal report of non-urgent examinations on patients referred

* The 2001 review did not ask specifically about reporting turnaround for A&E patients



by hospital clinicians has increased since 2001. This may be because radiologists consider these patients to be at less of a risk. However, one in four imaging departments said they had an average reporting delay of 10 days, which is significant in the light of the 18-week referral to treatment target. Also, it is not always possible for referring clinicians or for radiology staff to gauge urgency accurately.

On-line (hot) reporting

In 55% of hospitals, there is sometimes a radiologist or other skilled member of the radiology staff available to produce formal reports of urgent examinations as they are completed*. This on-line (hot) reporting ensures that appropriate decisions on treatment or discharge are taken as speedily as possible. However, on-line reporting is typically only available for seven hours each

weekday and not at weekends. Only 19 hospitals said that it was provided on Saturdays and 12 on Sundays. Just six provided it for 12 or more hours each weekday. Also, because of its heavy resource requirements, 32% of hospitals said that it was only sometimes possible to provide this service throughout the agreed hours.

In 31% of hospitals, on-line reporting is sometimes available for less urgent examinations of patients referred by an A&E department. But, again this reporting is typically available for just seven hours each day, and 19% of hospitals said that it was not always possible to provide such a level of service. Only eight hospitals said that on-line reporting was provided for A&E on Saturdays, and just five on Sundays. Only four said that it was available for 12 or more hours each weekday.

* Many other hospitals may have an informal system whereby the radiographer performing an examination draws attention to any problems that they notice, but this does not constitute formal reporting as no permanent record is made in the patient's notes.

Mode of reporting

In some trusts, the issue is not only how quickly reports of x-rays and scans are produced, but also whether radiology staff produce a formal report at all. Unless there is a documented agreement requesting clinicians to report certain types of examination themselves, all imaging examinations should be reported by radiology staff. However, as noted earlier, formal reporting is particularly important for patients referred by a GP or from an A&E department. Our 2005 survey showed that formal reports were always produced for these patients at 30% of trusts. However, at one in 10 trusts, more than 34% of examinations of A&E patients and 8% of those patients referred by GPs were never formally reported (see figure 11).

The percentage of examinations of patients referred by GPs in each trust that were reported by medically qualified radiologists fell from an average of 89% to 77% between 2001 and 2005, and the equivalent percentage for patients referred from A&E fell from 75% to 64%. This is because much of the reporting of these types of examination has now been taken over by skilled radiographers and ultrasonographers, leaving radiologists to concentrate on the more complex cases.

The roles of radiographers and ultrasonographers (discussed in more detail on page 30) have been greatly expanded:

- they now report 16% of all examinations, and in one in 10 trusts they report more than 30% of examinations
- they are involved in the formal reporting of A&E examinations at three out of four trusts (details are given in a data appendix on the Healthcare Commission's website)

- at 41% of trusts they sometimes report on plain films of patients (other than those referred from A&E)
- at 48% of trusts they report barium meals and enemas
- at 21% of trusts they report CT examinations, and at 6% they report MRI scans

All this enables radiologists to concentrate on the more complex cases, and has contributed to the reduction – from an average of 13% to 9.5% – in the proportion of examinations that are either never reported, or are presumed to have been reported by the referring clinician (when there is no formal agreement to do so). However, at one in eight trusts, more than a quarter of examinations are still never formally reported.

Availability of services

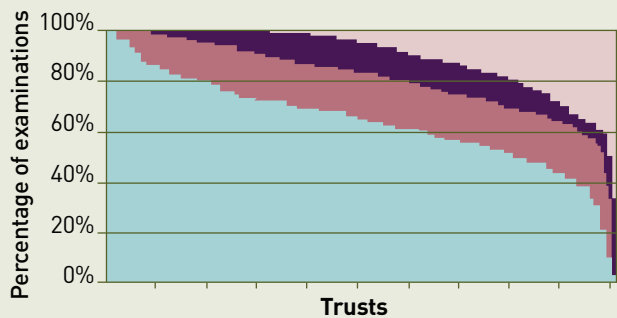
Imaging departments have to provide a round-the-clock service for patients referred in an emergency. For non-urgent examinations, however, they are typically open for only 40 hours a week, mainly because of the high marginal cost of providing staff to cover the department for longer than this. However, 40 hours is not always sufficient to cope with demand and also means that expensive equipment can lie idle for much of the week.

Our review found that only 23% of departments provided routine MRI services for more than 60 hours each week – fewer than were reported in the 2001 review. This is perhaps because fewer machines were available in 2001 to meet the demand.

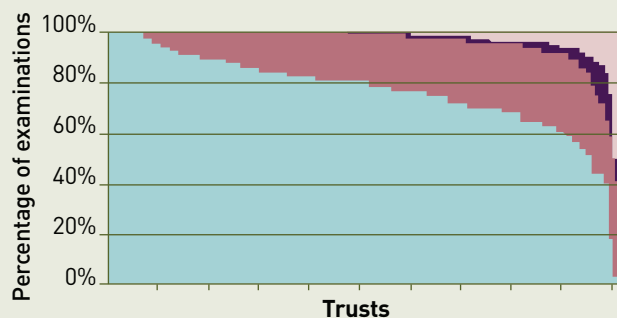
In contrast, standard operational hours for CT services have increased, with 14% of

Figure 11: Percentage of examinations that are formally reported

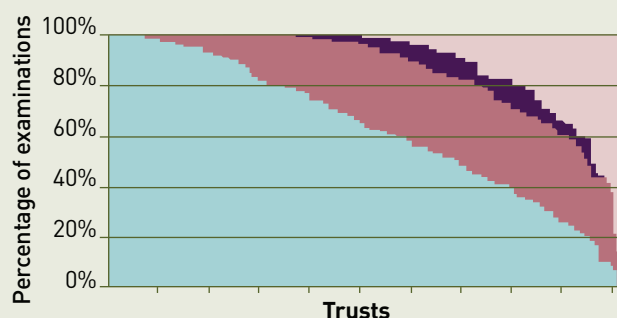
All examinations



GP referrals



A&E referrals



Unreported
 Referrer by agreement
 Radiographer etc
 Radiologist

Source: Healthcare Commission acute hospital portfolio data returns, April to September 2005

departments now operating these services for 60 or more hours a week. Fourteen per cent of departments also provide open access or GP-referred plain x-rays for 60 or more hours a week, including 30 departments that open on Saturdays and eight on Sundays. More departments may be forced to extend their hours and open at weekends to retain the current volume of referrals if patient choice and alternative provision by the independent sector becomes a reality.

Nearly all departments (97%) have formal on-call arrangements for staff to carry out emergency CT examinations outside normal hours, while 79% provide an on-call ultrasound service. Formal on-call arrangements for MRI services are less common (26% of departments). For interventional work, 48% of departments have arrangements although 62% provide them in some circumstances.

Convenient appointments

Nearly all acute trusts operate some 'one-stop-shop' clinics (in addition to fracture clinics) that provide for imaging and consultation during a single visit to the outpatient department. However, as recommended in previous reviews, services could be made more convenient for patients if there were a general system for coordinating imaging and outpatient appointments. At present, only 8% of hospitals have such a general system.

Almost half of referrals for imaging from GPs are examined in open-access sessions that do not need a prior appointment. In general, these sessions are for plain x-rays rather than for complex examinations. For the remainder, trusts have been encouraged by the Department of Health to adopt formal booking, in which a patient is given a choice of appointment time that is convenient for them, either at the time

of referral (full booking) or at a later date (partial booking). A quarter of all imaging examinations referred by GPs are formally booked, but booking is less prevalent for some types of referral from outpatient departments. (Details are shown in a data appendix on the Healthcare Commission's website.)

Who can refer patients for imaging?

The time spent waiting for a scan is affected by whether a GP can request the examination directly or whether patients must first be seen at an outpatient clinic. Policies differ between trusts as to who can refer patients for which types of examination (other than plain x-rays – for details, see the data appendix on the Healthcare Commission's website). These policies recognise the balance between convenience, cost and complexity of the examination. GPs can request ultrasound examinations directly in 93% of trusts, and a third of trusts will take referrals for ultrasound examinations directly from nurse practitioners. One in two trusts accepts referrals for CT scans directly from GPs and one in three accepts direct referrals for MRI examinations.

A child-centred service

An imaging department is an unfamiliar and sometimes frightening place for a child. Imaging departments in acute trusts examine an average of about 20 children a day (which is about 8% of all examinations), of whom fewer than half have been referred for diagnosis of injuries rather than a suspected medical problem. However, this number of children seen depends on local demography and proximity to a children's

hospital* or other alternative facilities. The majority of imaging departments must therefore ensure that they have appropriate facilities, staff and procedures for examining children – a vulnerable group of patients.

Our review asked about these procedures to test how well children were treated (see figure 12). We found that:

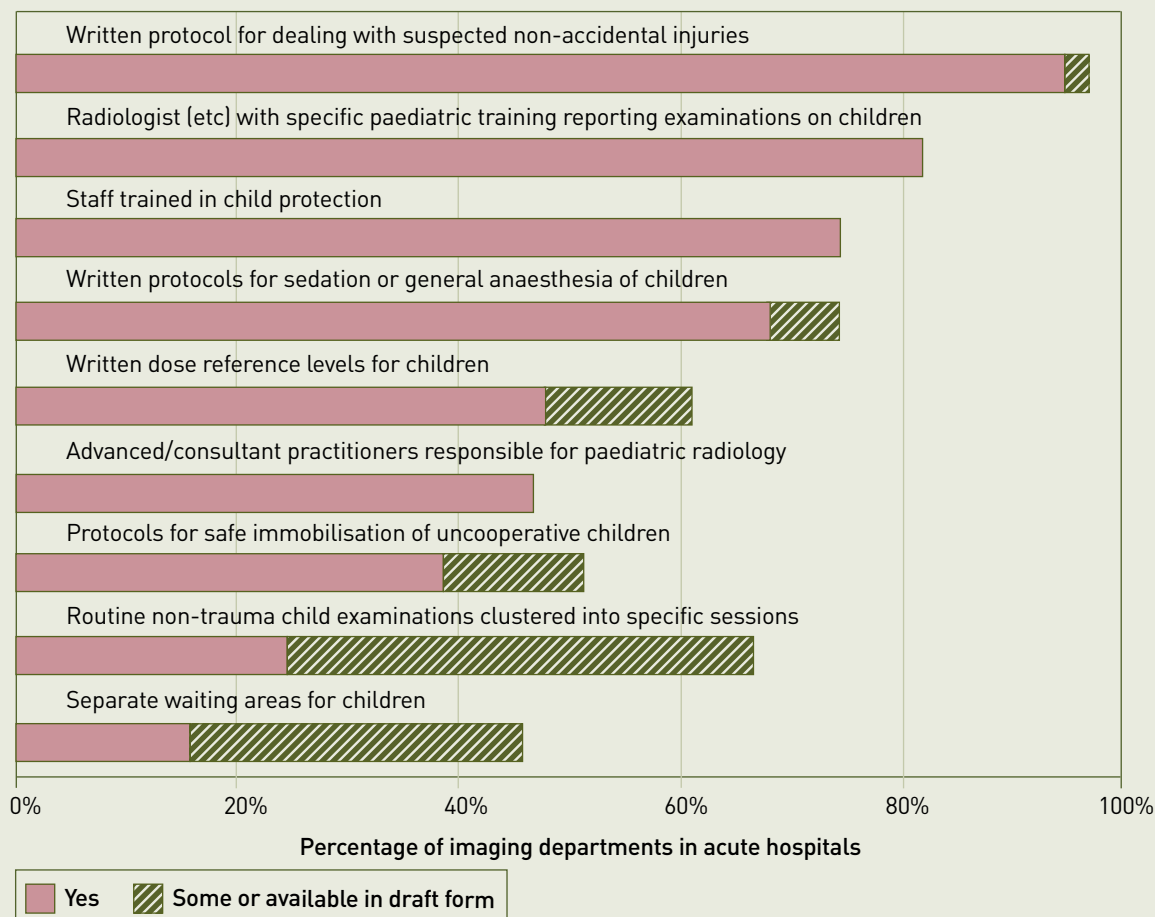
- almost all imaging departments had a written policy for dealing with suspected cases of non-accidental injuries,** and the staff at three out of four departments had undergone training in child protection
- four out of five had a radiologist with specific paediatric training who reported examinations on children. However, only 48% had a consultant or advanced practitioner with specific responsibility for paediatric radiology
- three-quarters of imaging departments had protocols, at least in draft, for sedating children or giving them general anaesthetics and more than half had dose reference levels for children available in written format
- two out of five imaging departments had agreed written immobilisation protocols (it is sometimes necessary to immobilise uncooperative children before they can be examined) and a further 10% had them in draft form

The greatest deficiencies we found concerned the separation of children from adult patients with potentially distressing conditions. Fewer than a quarter of all departments consistently grouped routine non-trauma examinations of children into separate sessions, although 64%

* Imaging departments of four acute trusts that are close to a children's hospital and therefore either see no children or only perform examinations in a children's A&E are excluded from the analysis in this section.

** It is possible that the five departments saying that they did not have a non-accidental injuries policy had a trust-wide policy that they failed to mention.

Figure 12: Arrangements for the examination of children



Source: Healthcare Commission acute hospital portfolio data returns: September 2005

sometimes did. Only 16% had separate waiting areas for children, although 45% reported some segregation. We recognise, however, that it may not be cost-effective to provide separate sessions or waiting areas for children if relatively few are examined.

Listening to those who use services

Our review found that 85% of imaging departments gather the views of patients, using various methods such as surveys of patients'

satisfaction (79%), suggestion boxes (64%), or some other form of engaging patients (46%). Seven out of 10 of these departments said that only minor changes had resulted from these consultations, whereas 16% reported more substantial changes. The remaining 14% had made no changes, although some suggestions were still under consideration.

Only a quarter of the departments that we reviewed regularly surveyed the views and satisfaction of GPs, whereas two-thirds sought feedback from clinicians within their own trusts.

Demand and capacity

As mentioned already, demand outstripped activity in some imaging departments during 2005. This section of the report looks at:

- how levels of activity vary between trusts and regions in relation to population
- the processes for modelling and planning demand
- the provision and use of equipment

The workforce, the other key constraint on expanding capacity, is reviewed under the section on departmental management and efficiency.

Rates of referral

There are marked variations between trusts in their rates of referrals for imaging. For example, one in 10 acute trusts with an A&E department performs more than 615 imaging examinations requested by that department for every 1,000 A&E attendees. At the other extreme, one in 10 performs fewer than half

that number of examinations (306) for every 1,000 A&E attendees.

This variation cannot be attributed to differences between trusts in how the source of referrals for imaging is recorded, as there is also significant correlation between the ratio of radiology examinations to patients attending A&E and the ratio of radiology examinations to outpatient attendances (including follow-ups) (see figures 13 and 14). This prompts certain questions: are both ratios similarly influenced by case mix? Or do they together suggest something about attitudes towards imaging in the trust and do they indicate a need for stricter guidelines on referrals? Quite apart from expenditure considerations, any unnecessary radiation of patients is a matter of concern.

There was even wider variation in the ratio of the number of inpatients that were referred for imaging to the number of finished consultant episodes. This ratio was three times greater in some trusts than in others, even after excluding the top and bottom 10% of departments. Again,

Figure 13: Imaging requested by A&E per 100 attendances

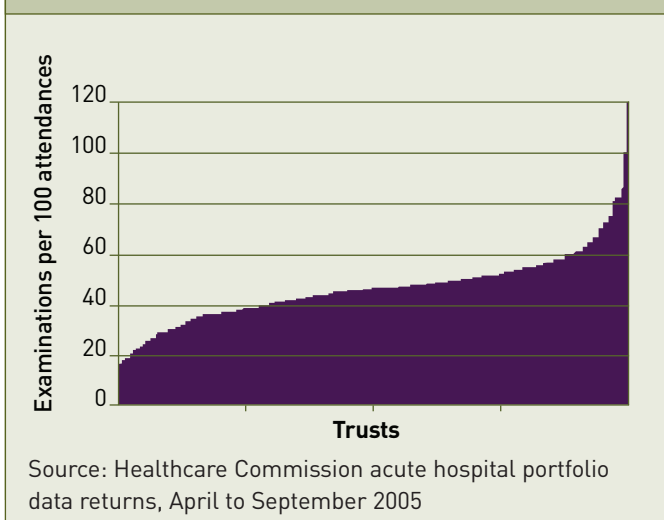
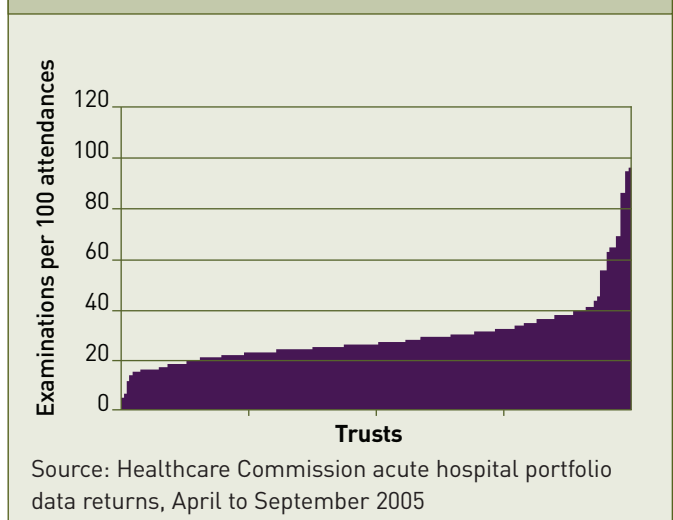


Figure 14: Imaging of outpatients per 100 attendances



departments with higher rates of referrals of outpatients tended also to have more referrals of inpatients, although this relationship was not statistically significant. This indicates that the variation is not due solely to differences between trusts in whether certain diagnostic tests are performed before patients are admitted or after their admission.

Reviewing processes and planning business

The former NHS Modernisation Agency stated that 'mapping processes' and 'analysis of capacity and demand' were key stages towards reducing delays. We found that all but 4% of imaging departments had carried out this work for some parts of their business and most said that they had made use of it in their business planning. However, only about a quarter had completed both stages fully and just 19% had used it for planning all areas of imaging activity. In addition, we found that:

- 85% of trusts had set up one or more service improvement teams covering some aspects of their work
- three out of every five departments had service level agreements with PCTs covering at least part of their work; in one in four departments these agreements embraced all of their primary care activity
- fewer departments (28%) had any internal service level agreements covering referrals from within their trust and only 9% had agreements covering all of this activity

Equipment

Since the 2001 review, there has been considerable investment in imaging equipment. The number of MRI scanners in acute and specialist trusts has risen by 39%, there are 23% more CT scanners and 22% more pieces of ultrasound equipment (see figure 15). In total, our 2005/2006 review found that for every million people there were 4.33 MRI scanners, 6.03 CT scanners and 21 non-obstetric ultrasound machines.

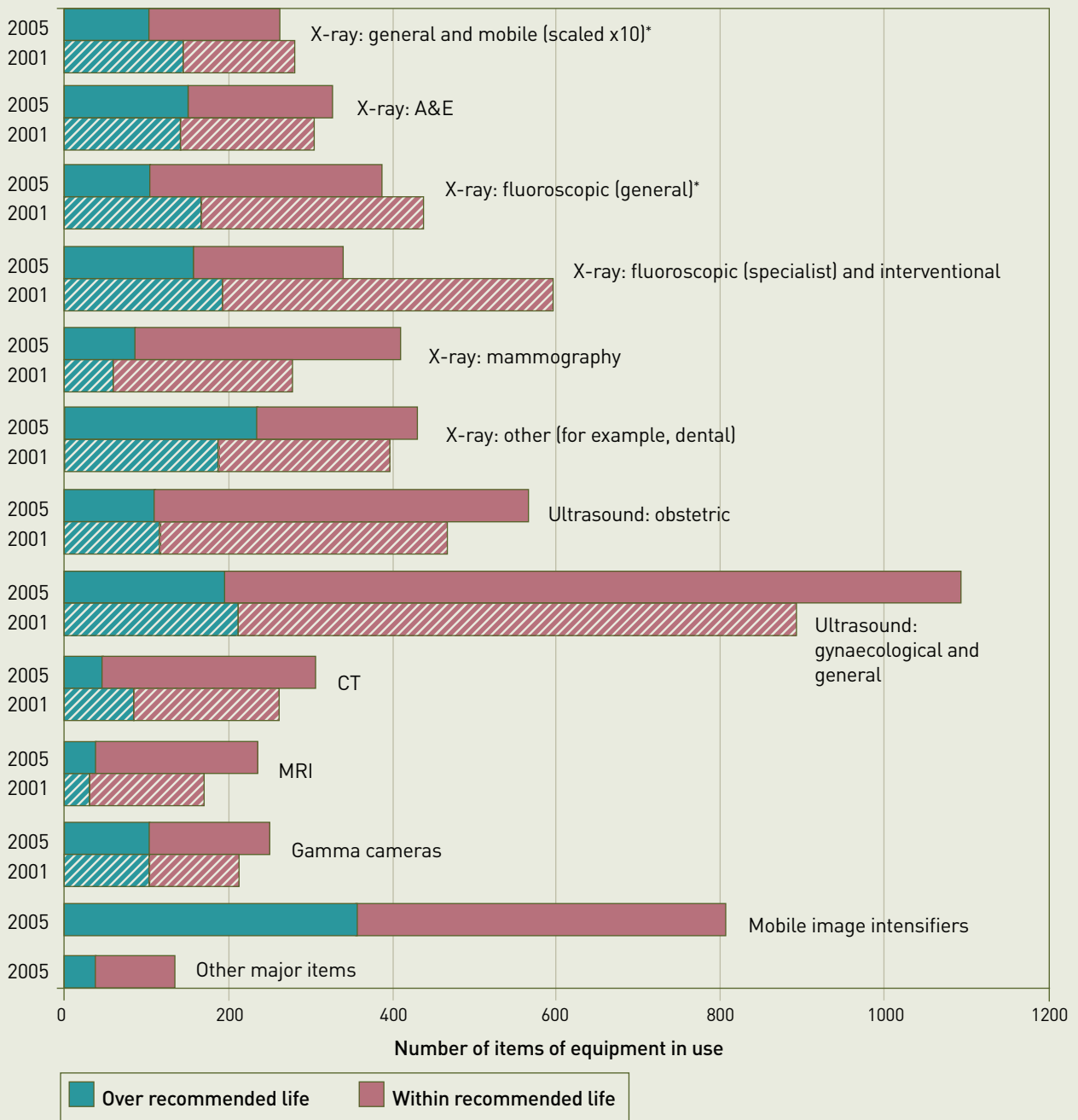
However, there are significant regional differences. For example, there are 24.8 non-obstetric ultrasound machines for each million people in the Yorkshire and the Humber region, but just 14.6 in the East of England region.

Age of equipment

The average age of imaging equipment was lower in 2005 than in 2001. In March 2001, 33% of CT scanners were older than seven years – the maximum lifespan recommended by the Royal College of Radiologists. By September 2005, only 15% were older than seven years. Similarly, the percentage of general x-ray machines in use that had exceeded their recommended 10-year lifespan fell from 53% to 40% between 2001 and 2005.

However, there is still a need for additional investment by some trusts. In a quarter of imaging departments, one in every three general ultrasound machines has exceeded its recommended lifespan and more than half the general x-ray machines are over 10 years old. Older machines are likely to break down more often, disrupting schedules, reducing efficiency, and causing examinations to be repeated. For general x-ray machines and others that involve use of radiation this could increase the risk to patients.

Figure 15: Imaging equipment – change in number of machines and their ages



Source: Audit Commission/Healthcare Commission acute hospital portfolio data collections. September 30th 2005 (solid bars) compared with March 31st 2001 (hatched bars). * The recommended lifespan is seven years except for asterisked items for which it is 10 years.

Thirty-eight per cent of imaging departments that we studied had agreed a programme with their PCT for replacing equipment, but these did not necessarily cover all types of imaging. Only 4% of departments had a fully-funded programme for replacing equipment.

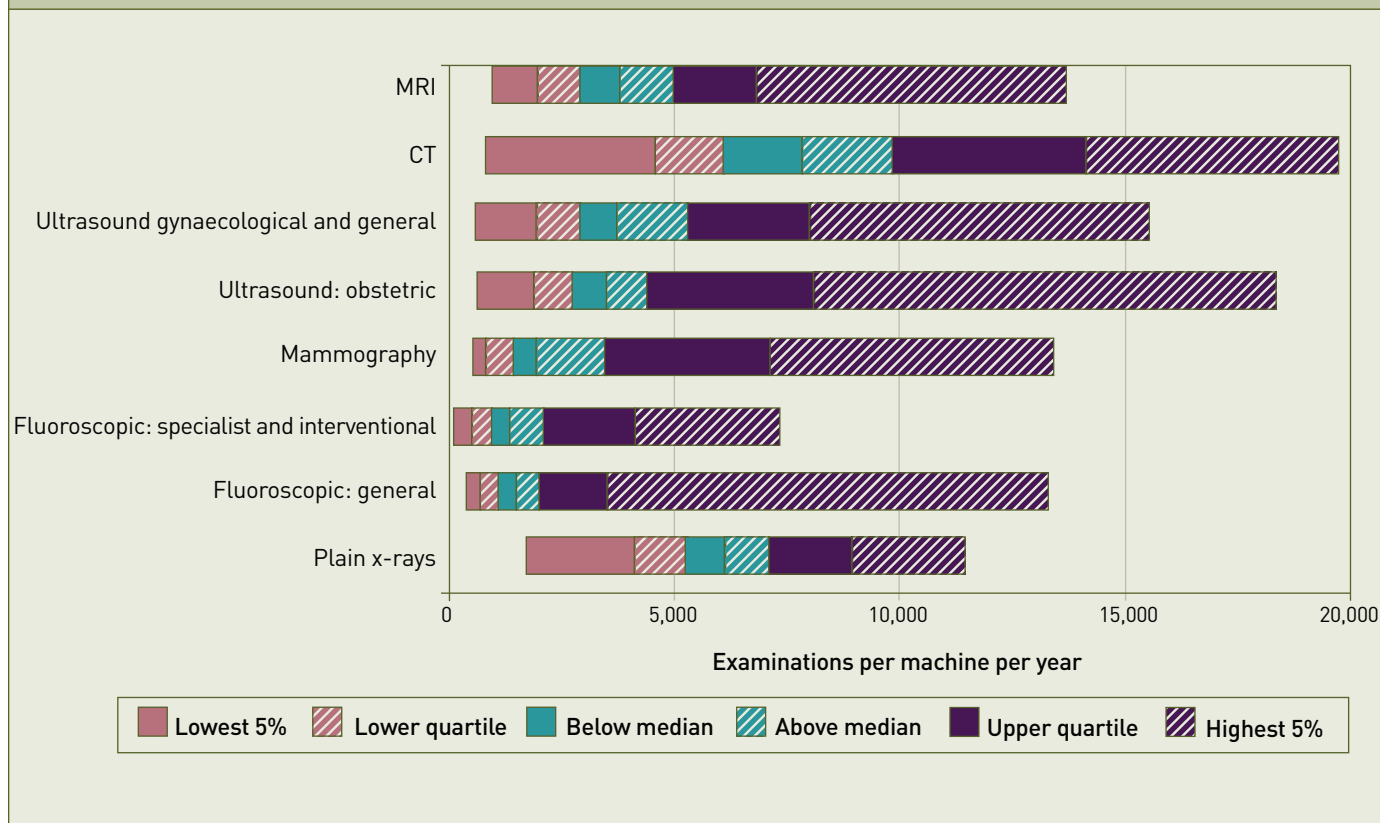
The intensity of use of imaging equipment

Although there is now significantly more imaging equipment in use than in 2001, it seems that most of it is being used more intensively. In particular, the average number of CT examinations that each scanner performs has increased by 46% and the number of MRI examinations by 26%, with big increases too in the uses of fluoroscopic

x-ray machines. These increases partly reflect the increasing capabilities, efficiency and reliability of modern equipment.

However, we found wide differences between imaging departments within acute trusts* in the average throughput of scanners (the number of examinations performed on each machine every year) (see figure 16). For example, 5% of imaging departments said that they performed more than 6,860 MRI examinations with each machine each year, whereas the 5% of departments that used their MRI scanners the least intensively had a throughput of less than 1,956 examinations for each machine.

Figure 16: Variation in throughput (use) of equipment between imaging departments



* Departments in specialist trusts are excluded from this analysis because general scans are not their core business. We have included data returned by all other acute trusts despite concerns that a few may have counted numbers of areas scanned rather than examinations. We comment elsewhere on the need for greater uniformity in the way workload is counted.

If machines are used too intensively, delays and breakdowns may result. Conversely, low throughput has obvious implications for efficiency.

This variation in throughput occurs partly because some scanners are in satellite departments or community hospitals where demand is insufficient for them to be used to full capacity. (Often they are placed in these locations at the request of the commissioning PCT.) In these circumstances, radiographers may have to travel between remote hospitals in order to operate machines on a part time basis. This highlights the tricky issues of the trade-off between quality of care, the convenience of patients and cost that can be raised by the continuing growth in provision of expensive equipment.

Funding restrictions may also prevent expensive scanners from being used to full capacity. For instance, some PCTs commission a fixed number of sessions each week. Over half of the imaging managers that we surveyed in September 2005 agreed that it would be possible to staff additional sessions if additional funding were available. Their estimates of potential extra activity were necessarily approximate, but they said on average that an additional 25% of MRI and CT activity and 18% more ultrasound examinations could be achieved.

With the current emphasis on meeting the 13-week milestone for waits and ultimately the 18-week patient journey from referral to the start of the treatment, it is essential that unused capacity is released without delay.

Departmental management and efficiency

Staff in imaging departments

Skilled and dedicated staff are the most important resources of an imaging department, but they also account for three-quarters of the cost (departments' budgets excluding capital charges). It is therefore important to consider the efficiency with which staff are used.

Our review did not suggest a *right* number and mix of staff for any imaging department with a particular level of activity, but only pointed out differences in ratios of staff relative to activity and differences in ratios of different grades of staff.

Having too few staff can lead to delays and stress that could, in turn, reduce the quality of care. However, having too many staff reduces the resources available for other improvements to services.

The mix of staff in imaging departments

There are wide variations between trusts in the mix of radiologists, radiographers and support staff that they employ. The Department of Health has supported trusts in reviewing this mix of skills to ensure that it is in line with their current needs.

On average there are four radiographers (and ultrasonographers) for each radiologist, but:

- one in 10 departments has more than 7.5 radiographers for each radiologist and an equal number have less than 2.8
- in some trusts, radiographers have taken over many roles traditionally performed by radiologists
- there are relatively more radiographers in the north and more radiologists in London, reflecting long-standing regional vacancy rates and a shortage of skills

- within regions, the lowest ratios of radiographers to radiologists tend to be in larger trusts and those performing more complex examinations
- nationally, superintendent radiographers or senior managers (many of whom carry a clinical responsibility at a specialised level or a level of advanced practice, in addition to their management role) form 14.5% of the total number of radiographers. However, excluding the top and bottom 10% of trusts, this ratio varies from 9% to 24%, with smaller trusts tending to have a higher proportion of senior staff

Support staff have an important role to play and are taking over some of the tasks traditionally performed by radiographers. Staff without a medical or radiographer/ultrasonographer qualification form 36% of the radiology workforce. We found no link between the proportion of support staff and the size of department.

Extended roles

We have mentioned the extent to which radiographers and other non-medical staff have taken over the reporting of certain types of examination from radiologists. In a few trusts they also have more extensive responsibilities (see the data appendix on the Healthcare Commission's website) including leading follow-up breast or colorectal clinics (6%) or treatment review and assessment clinics (6%). Others lead intravenous urography services (9%), undertake venography (9%) or adult cystograms (6%). More commonly, in 31% of departments, they undertake interventional procedures, such as angiography or biopsy. Such extensions of their roles are believed to improve job satisfaction and opportunities for career progression.

This trend towards giving radiographers a greater role in reporting may have been spurred, in some trusts, by shortages of radiologists. But, paradoxically, the total number of extended roles adopted is greatest in larger departments, which, as already described, have fewer radiographers for every radiologist. It therefore appears that the development of extended roles for radiographers has not been driven by shortages of radiologists.

Productivity of staff

In order to compare the activity of staff in imaging departments of different trusts,* it is necessary to:

- ensure that examinations are counted in a consistent way
- agree what staff are required for different types of examination

Unfortunately imaging departments in different trusts do not, in practice, count numbers of examinations in a consistent way. For example, when several views are taken of the same patient, some trusts would deem that only one examination had been carried out, whereas others would consider that several had been carried out. Similarly, if an examination is performed using a contrast medium, some trusts would deem that only one examination had been carried out, whereas others would say two. Furthermore, some examinations do not fall neatly into one of the workload categories developed by Keele University.

For our review, we adopted a pragmatic approach to answering queries from trusts on how to quantify their activity, striving to maximise consistency. But the lack of common definitions of activity, particularly for the more

complex examinations, means that there can be no consistent method for comparing the productivity of different trusts, or their costs.

There is also no ideal way to weight the requirements for resources of different examinations. We used a simplified version of the Körner weights for each type of examination (see Appendix). These weights estimate, for example, that a CT examination requires the same amount of effort as six plain-film examinations. However, in practice, the relative amounts of time required from a radiographer for particular types of examination may be significantly different from those required from a radiologist. Also, the Körner weights date from the mid-1990s and do not reflect subsequent advances in technology. The development of an agreed up-to-date set of weightings is greatly needed.

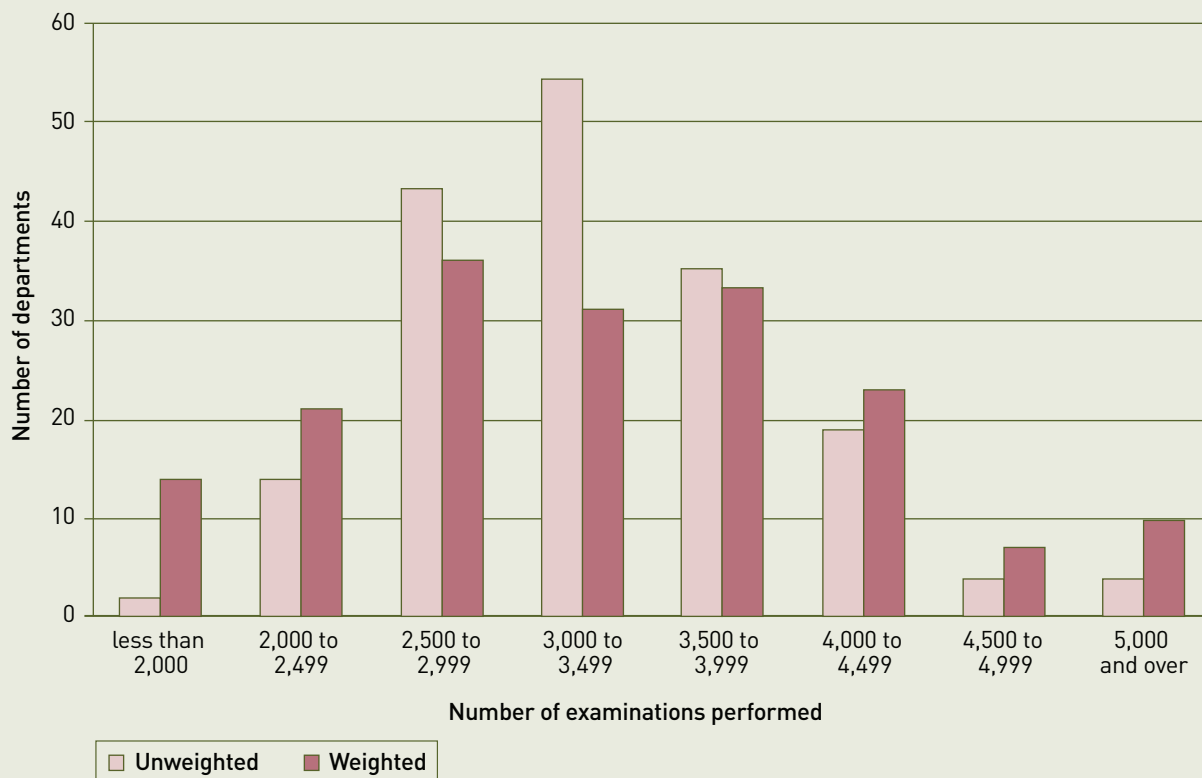
One advantage of using these weights, though, is that they enable direct comparisons with the Audit Commission's 2001 review and an analysis of changes in productivity since then. We found that each radiographer performed 5% more weighted examinations in 2005 than in 2001. The variation between trusts in the productivity of radiographers has also narrowed in that period, with little or no increase in productivity in many of the departments that already had very high levels of activity for each radiographer.

However, there is still a great variation between trusts (see figure 17), with radiographers in some hospitals performing more than twice as many examinations each year as those in others**. The difference between the productivity of departments is less if it is calculated in terms of the number of unweighted examinations carried out by each

* We included agency/locum staff as well as whole time equivalent permanent employees. We have subtracted from this the percentage of time that each grade of staff spends on national breast screening.

** Comparing the 10th and 90th percentile of weighted activity per radiographer by department.

Figure 17: Examinations per radiographer/ultrasonographer



Source: Healthcare Commission acute hospital portfolio data returns, September 2005

radiographer. This throws doubts on the continued validity of the Körner weightings for this element of the assessment.

In contrast, when we looked at the workload of radiologists, we found that there was a better statistical correlation between the numbers of radiologists in post in each trust and numbers of examinations if this activity was adjusted to reflect its complexity by using the Körner weightings. However, once again there were large variations between trusts. These variations are no fewer if an alternative system of assessing the activity of consultant radiologists is adopted, based on the number of examinations of each type reported, the number of clinical sessions

worked and recommendations from the Royal College of Radiologists on the average number of reports completed in each session.

There do appear to be economies of scale, with the largest departments having fewer radiologists for each Körner weighted examination than smaller ones. This may be because on-call, administrative and other non-clinical commitments are shared between more doctors.

Stability of the workforce

Factors such as the turnover of radiographers, sickness, absence, vacancy rates and the use of locums and other temporary staff were of particular relevance to the local reports

prepared for each trust by reviewers appointed by the Audit Commission.

Turnover of staff:* the median turnover rate for radiographers was 6% – lower than for the other diagnostic services we reviewed. However, one in 10 imaging departments had rates exceeding 15%. High turnover, of course, can have a detrimental effect on efficiency.

Sickness and absence: the median rates of sickness and absence (including long term sickness and maternity leave) were 4% for radiographers and 3.1% for other non-medical staff. These figures were below the absence rates observed in previous acute hospital portfolio studies for other groups of NHS staff, such as nurses. However, 5% of imaging departments reported rates of sickness and absence in excess of 10%. Short term sickness among radiographers (normally defined as absences of 28 days or less) averaged 1.4%.

Vacancy rates: the median rate of funded vacancies for radiologists was 8.4%. However, more than a third of medical posts were vacant in one in 10 imaging departments. There was a lower national vacancy rate for radiographers than for radiologists: the median was 5.3%, although more than 15% of radiographer posts were vacant in one in 10 departments.

Those departments with high vacancy rates are more reliant on the use of locums, bank and agency staff and overtime in order to maintain high levels of patients examined and standards of reporting.

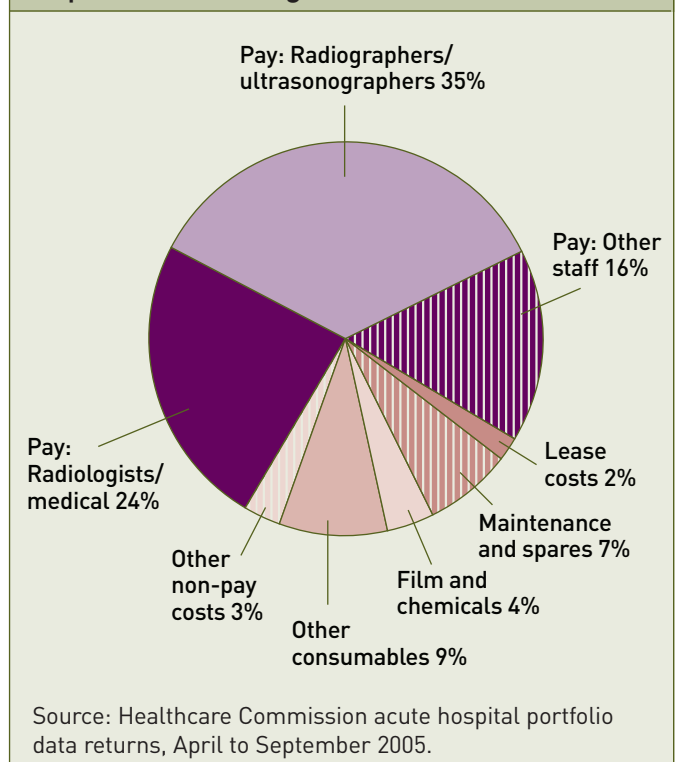
Temporary staff: on average, just over one half of all radiologist vacancies were filled by locums, and in 10% of hospitals they filled more than one in five radiologist posts. Less

use is made of bank and agency radiographers, but in 7% of hospitals more than one in 10 staff are temporary.

The high usage of locums and bank and agency staff has an impact on cost. In addition, their unfamiliarity with the layout and procedures of the unit can also be detrimental to the care of patients.

Locum and agency staff: there are big variations between the imaging departments of different trusts in their use of locums and agency staff to cover vacancies. At five trusts, over half of the radiologists are locums, and at 13 trusts more than 10% of radiographers are

Figure 18: Breakdown of imaging departmental budgets



* Calculated as the number of staff that left during the year divided by numbers (not whole time equivalents) in post at the end of the period. This calculation assumes that there have not been major changes to the service during the year and that numbers of staff in post at the end of the year were not atypical of the total period.

agency staff. Expenditure on locum and agency staff averages just 3.4% of the total staff costs of imaging departments, but in three trusts locum and agency staff account for more than 20% of the staff budget.

High expenditure on locum and agency staff significantly affects efficiency. There is a strong relationship between the high use of locums and agency staff and high unit costs for each examination.

Unit costs

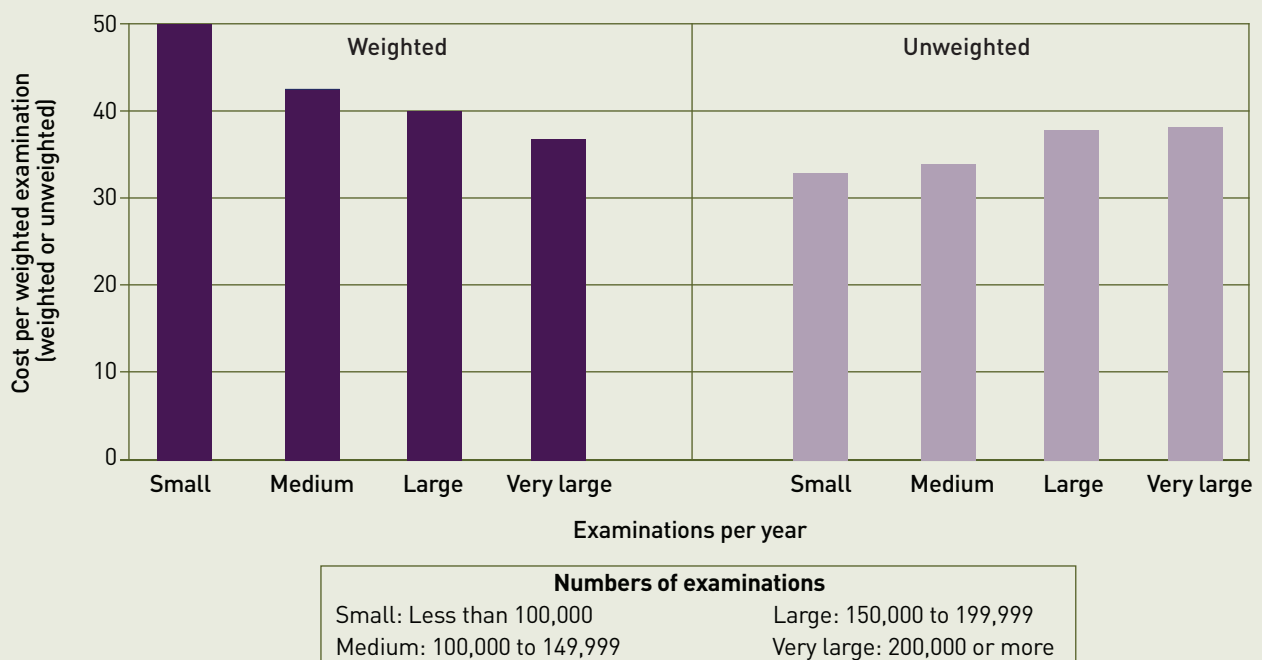
Figure 18 shows that staff account for three-quarters of the budgets of imaging departments (excluding capital charges). Non-pay costs vary, for example, according to whether a department

has a PACS, with its associated maintenance costs, instead of using film and chemicals, and according to the proportion of the department's equipment that is leased.

The total costs for each examination in imaging departments in 2005 averaged £34.22, but exceeded £48 in 10% of imaging departments. This reflects the different mix of examinations that they undertake. However, there was no less variation between trusts in unit costs for each weighted activity.

Our 2005/2006 review confirmed the findings of the 2001 acute hospital portfolio review that average costs for each examination weighted for complexity using Körner units (see Appendix) are significantly lower (26%) in larger departments than in smaller ones (see figure 19). The report

Figure 19: Unit cost per examination by size of department (weighted and unweighted)



Source: Healthcare Commission acute hospital portfolio data returns, March to September 2005

on the 2001 review suggested that larger departments could be more economical because, for example, they were able to spread the fixed costs of equipment over more examinations. It also highlighted differences in productivity by trust type. However, the validity of these findings is dependent of acceptance of the continuing validity of the Körner weightings. It is striking that costs for each unweighted examination are higher, rather than lower, in larger departments.

Use of information technology

Picture archiving and communications systems (PACS)

PACS store images electronically so that they can be accessed from local and remote screens. The major capital and maintenance costs of PACS are more than offset by the benefits of the quicker availability of images required for diagnosis, the ability to view high definition images wherever they are required and secure storage with no risk of films being mislaid. If necessary, patients can be examined at one hospital and the results expertly interpreted at another.

At the time of the 2001 review, just 13% of imaging departments had a PACS. In our 2005/2006 review we differentiated between full PACS and mini PACS. Full PACS have facilities for automatically sending images to radiologists for reporting and to requesting clinicians at a majority of sites across the trust. Mini PACS, a cheaper alternative to a full PACS, lack comprehensive routing facilities and typically give access to only a minority of requesting clinicians. By September 2005, 32% of departments had installed a full PACS (see figure 20), although 5% of them were not accessible from all of the sites managed by these departments. A further 21% of

departments had a mini PACS. Additionally, 13% of departments without a full or mini PACS said that they were nevertheless able to transmit digital images to some requesters. Sixty-eight per cent said that their system fully or partly supported home access to images by radiologists.

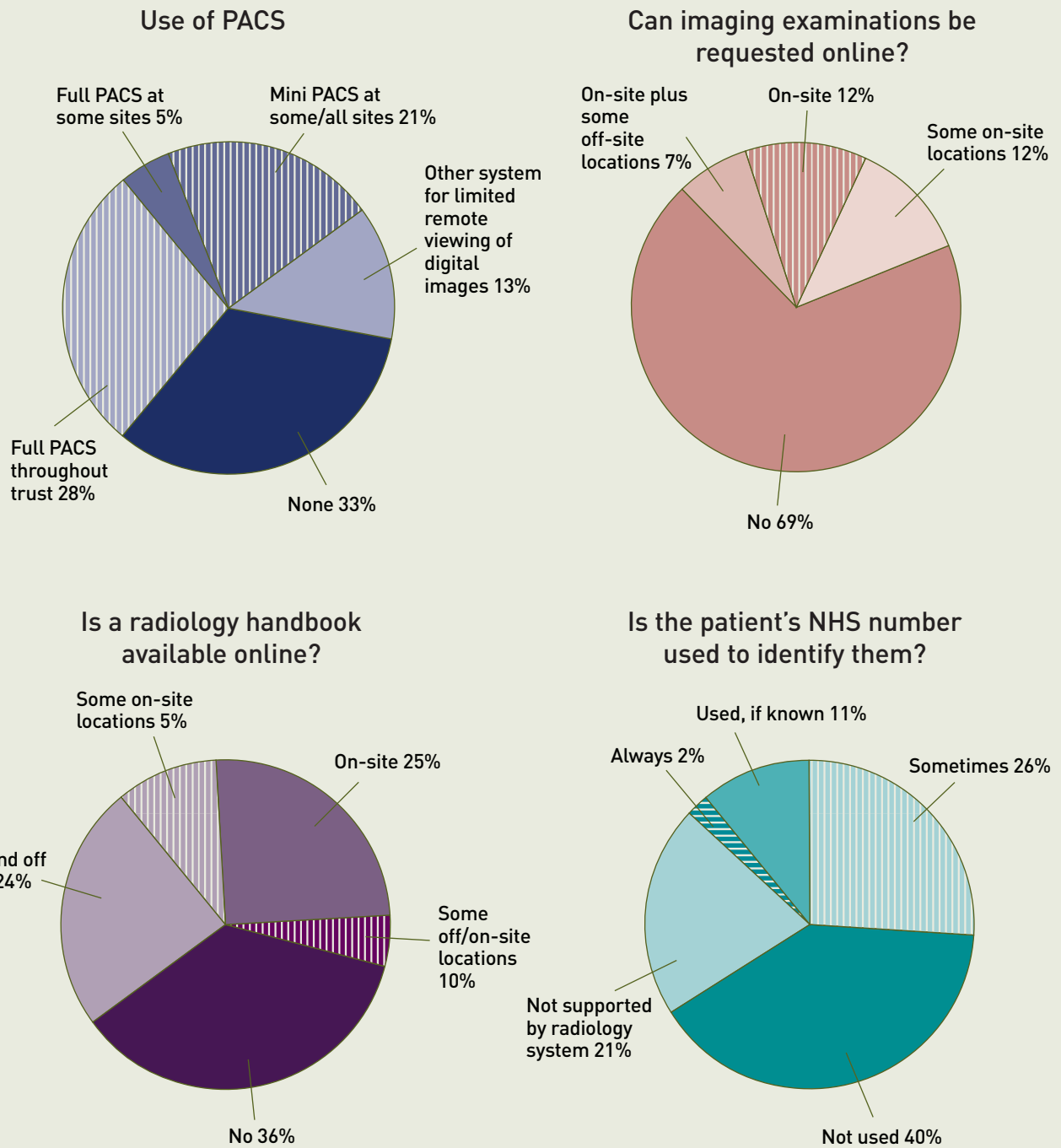
Implementation of PACS is a key element of the NHS's Connecting for Health programme. This aims to provide comprehensive access at all NHS locations by March 2007. We understand that accordingly there has been a major expansion of PACS facilities since the date of our review, although their capabilities are not yet being used to the full.

Electronic requesting

Electronic requesting of diagnostic examinations is another important element of the NHS' National Programme for Information Technology. Thirty-one per cent of imaging departments had electronic requesting of some examinations in November 2005, compared with only 22% in 2001, but it was not always available from all on-site locations, such as clinics. Only 7% of departments provided electronic requesting from off-site locations. There were still very few hospitals (3.6%) where imaging appointments could be made electronically, and in those where it was available electronic requesting was usually restricted to a small group of clinicians (see figure 20).

The major potential benefits of electronic requesting, in addition to greater convenience for both clinician and patient, are that the system can prompt those requesting to ensure that examinations are appropriate and tells them about previous examinations of the same patient. This helps to reduce the number of examinations that have little additional benefit for diagnosis or treatment. Twelve per cent of

Figure 20: Use of information technology in imaging departments



Source: Healthcare Commission acute hospital portfolio data returns September 2005

departments said that they had electronic requesting facilities that support protocols (and 3% said that they had systems that partly did this). Twenty-two per cent had requesting facilities that displayed previous examinations.

Using a patient's unique NHS number as their 'identifier' for imaging examinations reduces unnecessary duplication of examinations (a patient may, for example, have had a similar scan at the request of a GP). But only 13% of surveyed departments said that they routinely used NHS numbers to identify patients (including 11% that said they used it if known), and a further 26% sometimes used it. However a majority of trusts did not use patients' NHS numbers, and 21% said that their radiology system did not have the facility to do so (see figure 20).

Monitoring management data

Our review asked about issues that imaging departments monitor or audit (see figure 21). These include:

Quality of referrals: the National Radiological Protection Board estimated in 1990 that 20% of x-rays did not enhance the care of patients. It is therefore important that imaging departments periodically monitor the appropriateness of referrals (71% do this), and the numbers of requests made by individual trust doctors (39% do this) and GPs (32%) to identify potential sources of inappropriate demand. The quality and completeness of requests, which was monitored by 58% of trusts, is important for ensuring that the right views are taken.

Operations: two-thirds of departments monitor variations in the level of demand by time of day and day of week to ensure an appropriate number of staff and to minimise waiting times for patients. However, less than a half monitor

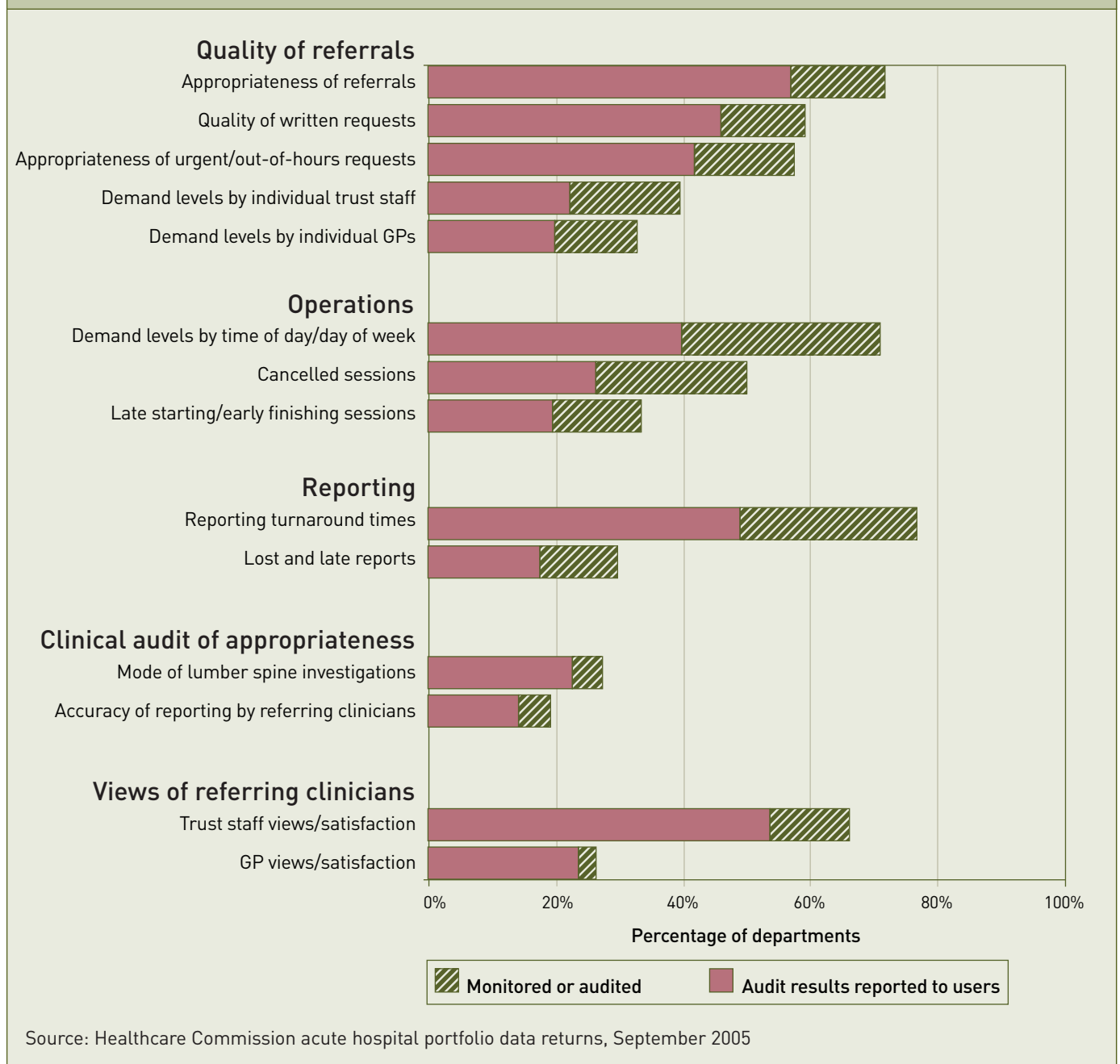
the number of cancelled sessions and a third monitor those that are under-used to ensure that expensive equipment is not left idle where there is still unmet demand.

Reporting: availability of a report when required is a prime concern of referring clinicians. Turnaround times for reports are monitored by 76% of trusts but only 29% collect data on the number of lost or late reports.

Clinical audit of appropriateness: lumbar spine investigations for back pain are usually inappropriate and 27% of departments monitor these investigations to ensure that they conform to good practice.

Views of referring clinicians: more departments survey the views of staff in the trust (65%) than those of GPs (26%).

Figure 21: Issues monitored by imaging departments



Conclusions and recommendations – the way forward

Our review has shown that, despite increasing demand, there have been significant improvements in imaging since the Audit Commission's acute hospital portfolio review in 2001:

- waiting times have been reduced in many parts of the country
- a higher proportion of examinations are formally reported
- there are more scanners, and less equipment that has exceeded its recommended lifespan
- the productivity of staff has increased in many departments and there are more staff with extended roles
- there has been investment in PACS, and in other IT systems, which has improved the speed and quality of reporting

However, our review has also shown that:

- there are still unacceptable waits, which are a concern to both patients and clinicians
- in many trusts, images are not being reported faster than in 2001
- there are major unexplained differences in rates of referral
- there appears to be wide variation between trusts in productivity and in unit costs

Recommendations

Nationally:

- there is an urgent need to standardise the way that imaging activity is counted. There is also a need to revise weightings that recognise the differing requirements for resources of each type of activity. This will

facilitate the introduction of tariffs and enable equitable comparisons to be made of value for money across the NHS and with the independent sector

- the clinical justification for the major differences in referral and request rates for imaging across the country and between hospitals should be examined critically with a view to spreading best practice on the circumstances in which examinations are requested

Imaging departments, with their trust management and commissioning PCTs should:

- complete analyses of capacity and demand and use them to inform planning and to agree funded programmes for procurement and replacement of equipment
- increase the proportion of imaging activity covered by service level agreements
- consider the impact of all decisions about major development of services upon the workload and expenditure associated with imaging
- ensure that reasons for all abnormally high or low productivity or unit costs are understood and justified and that action is taken to reduce unexplained variation. This may require a further review of the workforce, of the mix of skills in the light of changes in demand, and of roles, equipment and processes. It may also require a review of the continuing need for retaining under-used services in satellite locations. Meanwhile, exceptionally high workloads may prompt a review of referral patterns or an audit of the justification for high numbers of requests, as well as a re-examination of roles

- make full use of the investment made in IT systems, such as PACS, digital dictation and voice recognition software, and electronic booking and reporting systems

A minority of trusts and their commissioning PCTs need to increase their efforts to reduce the number of patients waiting for more than 13 weeks for some types of scan. To help them do this, they should assess:

- their processes for managing waiting lists
- the number of separate queues that they have for the same type of examination
- their opening hours and whether, if required, extra funding could be agreed with PCTs to enable complex scanners to be run for additional hours
- the way that patients move through the department
- whether the roles of radiologists, radiographers/ultrasonographers and support staff reflect the current needs of the department
- whether some examinations or reporting should be re-allocated to other NHS providers, or to the independent sector

Clinicians should:

- ensure that formal agreements are put in place as to who will report different types of examination (according to the source of referral) and within which target timescales, so as to meet clinical needs

Appendix: Weightings used when calculating productivity

The activities of imaging departments can be weighted for complexity using either 'Körner weights' (representing relative effort) or by using the points system devised by the Royal College of Radiologists. This points system is

based on the expected number of reports each year for each weekly clinical session by a radiologist. The former is more comprehensive, but neither is perfect.

Workload category	Körner weight	College points
Plain film reporting x-rays (excluding mobiles and theatres)	1	3080
Mobile x-rays	2.5	3080
Theatre x-rays	6	3080
Ultrasound (gynaecological, obstetric or general)	2.5	616
CT	6	396
MRI	60	352
Barium meals	6	528
Barium enemas	6	264
Fluoroscopy (including cystograms, sinograms, venograms)	30	
Mammography	30	
Intravascular ultrasound	12	
Imaging guided diagnostic procedures (includes biopsies)	12	
Diagnostic arteriography	60	
Interventional (therapeutic) procedures (vascular and non-vascular)	60	132
<i>Additional weightings assumed for the purpose of this review:</i>		
Nuclear medicine (old categories I – IV)*	6.2	
Complex nuclear medicine (complexity equal to or greater than a thyroid scan 1-123 or a dynamic renal Mag-3)	24	
Other examinations	30	

For nuclear medicine an average Körner weighting based on mix of old category I to IV activity reported during 2001 review was used – the error introduced was less than 1%

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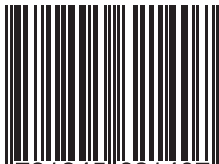
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