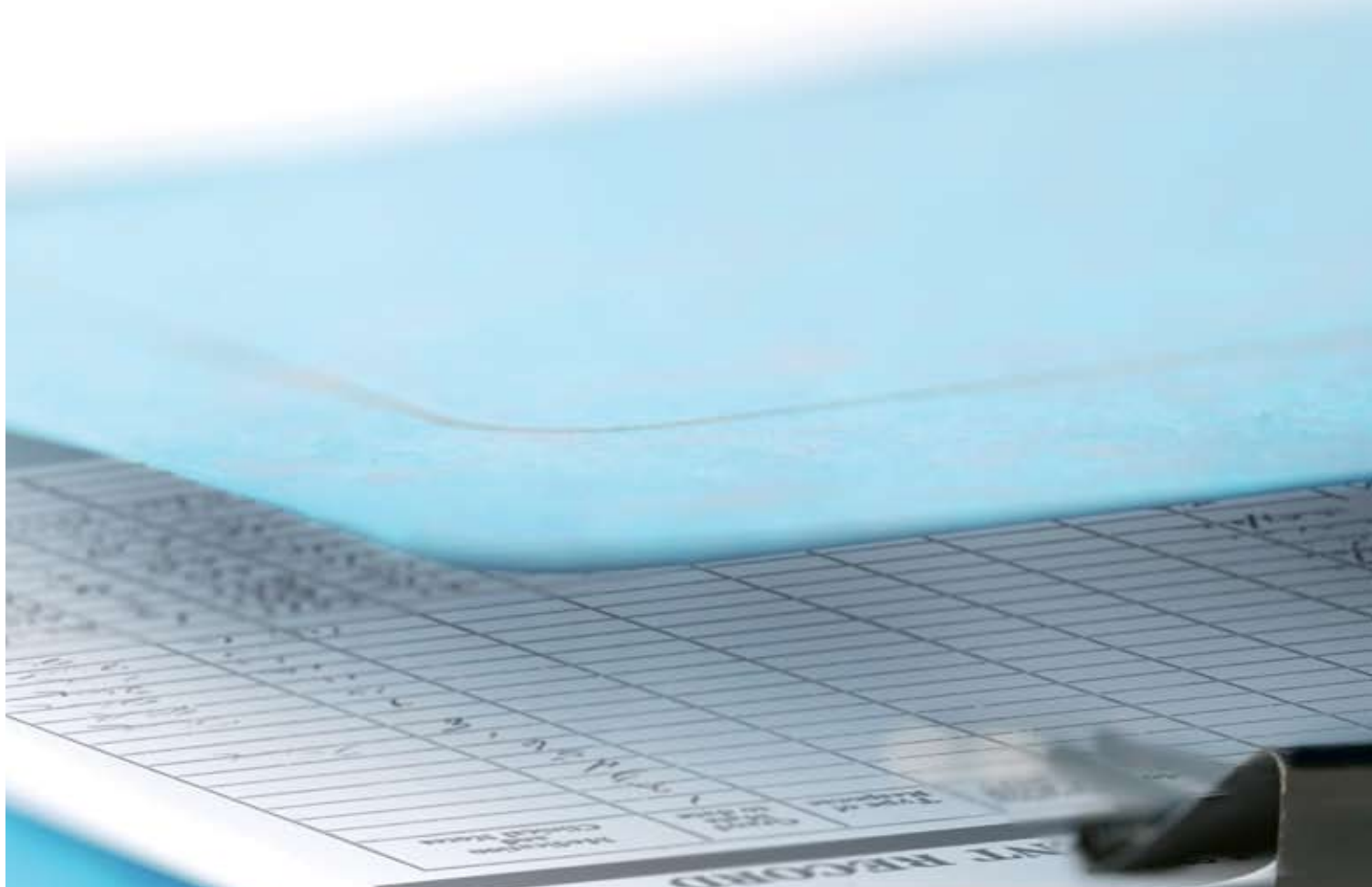


Review of NHS diagnostic services



Prepared for the Auditor General for Scotland
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Summary



The NHS has cut waiting times for diagnostic tests and improved the quality. But resources could be used more efficiently.



Summary

1. Diagnostic services are an essential part of the healthcare system.

They help patients get an accurate diagnosis and the right treatment.

Delays in getting a test or reporting the results mean patients have symptoms and are anxious for longer, and treatment may be less effective.

2. This report looks at three of the main types of diagnostic services:

- radiology services (images of the body such as CT scans)^{1,2}
- endoscopy and cystoscopy services (endoscopy procedures look inside the bowel and stomach and cystoscopy procedures look inside the bladder)
- laboratory services (tests on blood and tissue samples).

3. For many patients diagnosis involves tests from each of these services. For example, a diagnosis for some types of cancer depends on radiology, endoscopy and laboratory tests as well as input from a range of medical, nursing and technical staff. All three services face similar challenges, such as making sure enough staff and equipment are available to meet demand.

4. NHS diagnostic activity has grown over the last four years. Between 2003/04 and 2006/07, the number of patients who had a CT, MRI and ultrasound tests (radiology tests) increased by 38 per cent to almost 736,000. The number of endoscopy and cystoscopy procedures increased by ten per cent over the same period;

almost 168,000 procedures were carried out in 2006/07. The number of laboratory tests also rose: in 2006/07, there were almost 73 million clinical chemistry tests, a 50 per cent increase since 2003/04.^{3,4}

5. The NHS spends a lot of money on diagnostic services. In 2006/07, it spent over £178 million on radiology services, £64 million of which was spent on MRI, CT and ultrasound services. It spent £246 million on laboratory services, including £48.5 million on testing over 8.7 million blood specimens and £49 million on testing human tissue samples.⁵ There is no published information on how much the NHS in Scotland spends on endoscopy and cystoscopy services but this is also likely to be substantial.

6. A number of waiting times targets affect diagnostic services. A national target was set in 2005 to improve patients' access to diagnostic tests: from the end of 2007, patients should not wait longer than nine weeks for eight key radiology and endoscopy tests.⁶ This target was backed by £50 million of additional investment from the Scottish Executive over three years to 2007/08.⁷

7. The new 'referral to treatment' waiting time target states that, by the end of 2011, the time between any referral and a patient starting treatment should be no more than 18 weeks. This target covers all stages of a patient's care including diagnostic tests and will, in effect, replace existing targets relating to different parts of NHS services, such as outpatient, inpatient and diagnostic services.

Key messages

- NHS boards have reduced waiting times for eight key radiology and endoscopy diagnostic tests. They have achieved these reductions by doing additional work funded by waiting list money and by making changes in how they manage and deliver services. Making further sustainable improvements to achieve the new 18-week referral to treatment target will be challenging.
- NHS boards have taken action to improve the patient's experience of diagnostic services. The quality of care for patients having endoscopy procedures is improving and hospitals perform well in how quickly they carry out inpatient radiology scans. But the time it takes to report radiology and laboratory test results varies across hospitals. NHS boards could do more to offer patients choice of appointment date and time.
- The information available suggests there is variation in the efficiency of radiology, endoscopy and laboratory services which is not fully explained by the type of hospital, the complexity of the work it carries out, or differences in how hospitals record activity data. There is scope for more efficient use of resources.

1 In this report we use the term radiology rather than imaging.

2 Computed Tomography takes two or three-dimensional images of the inside of the body. A glossary of terms can be found at Appendix 4.

3 ISD data.

4 Clinical chemistry is one of the main types of laboratory disciplines.

5 ISD Cost Book.

6 The eight key tests are MRI, CT, non-obstetric ultrasound, barium enema, upper GI endoscopy, sigmoidoscopy, colonoscopy and cystoscopy. At that time, these tests covered an estimated 75 per cent of patients on waiting lists for a diagnostic test.

7 In 2007, the Scottish Executive changed its name to the Scottish Government. Where appropriate this report refers to the Scottish Executive rather than the current Scottish Government.

- The NHS does not have some of the basic information it needs to ensure diagnostic services are provided efficiently. Where data do exist, they are not consistent. The NHS needs better information to manage these high-cost services and to compare efficiency across NHS boards.

Key recommendations

The Scottish Government should:

- work with NHS boards and the Information Services Division of NHS National Services Scotland (ISD Scotland) to improve data collection systems for all diagnostic services as a matter of priority
- ensure robust benchmarking data are available to allow NHS boards to compare efficiency.

ISD Scotland should:

- work with the Scottish Government and NHS boards to improve the quality and consistency of national data sets that include diagnostic services, particularly the Cost Book.

NHS boards should:

- develop clear referral protocols and increase the range of diagnostic tests that GPs can refer patients for directly
- ensure that patients are offered a choice of date and time for elective diagnostic appointments

- ensure that planning for the new 18-week referral to treatment target includes diagnostic services as a core component
- work with ISD Scotland to standardise the way diagnostic activity is counted and ensure data are recorded consistently
- improve collection and reporting of local information on the performance of diagnostic services
- make use of benchmarking data to identify potential improvements in efficiency on an ongoing basis.

8. Recommendations are made at the end of each section. These have been used to prepare a self-assessment checklist for NHS boards to help them monitor progress against the recommendations (Appendix 6). We have also produced a separate document for NHS board non-executive directors, available from the Audit Scotland website www.audit-scotland.gov.uk.

About the study

9. This report examines the efficiency and effectiveness of radiology, endoscopy and laboratory services across 22 hospitals in a sample of five NHS boards: Ayrshire and Arran, Greater Glasgow and Clyde, Lanarkshire, Lothian and Orkney⁸ (Appendix 2). We focused mainly on the eight key diagnostic tests covered by the national waiting times target of nine weeks and looked at four disciplines within the laboratory service.⁹ Data are mainly from 2006/07 and were the most up-to-date national data available for the three services at the time of the study.¹⁰

10. In the course of the study we:

- analysed national data published by ISD Scotland on activity and costs for radiology and laboratory services
- analysed unpublished staffing, activity and cost information from the NHSScotland Radiology Benchmarking Project and the Keele University Laboratory Benchmarking Scheme
- collected and analysed additional data about radiology, endoscopy and laboratory services in five sample NHS boards
- looked at performance against efficiency indicators, making comparisons with England where appropriate (Appendix 3)
- interviewed staff and reviewed relevant documents from the Scottish Government and the sample of NHS boards.

11. The report is organised into four parts:

- Part 1. Introduction
- Part 2. Improving the patient experience
- Part 3. Approaches to improve diagnostic services
- Part 4. Efficiency of diagnostic services and performance management.

12. A glossary is provided at Appendix 4.

⁸ Not all hospitals in the sample NHS boards provide each service.

⁹ The four laboratory disciplines are microbiology, histopathology, haematology and clinical chemistry. One of the sample NHS boards did not separate out histopathology and cytology cost data in its submission to the Keele Benchmarking Scheme. We indicate in the report where we include cytology information.

¹⁰ Keele Benchmarking data for laboratory services and NHSScotland Radiology Benchmarking Project data at NHS board level are from 2006/07. Snapshot audit data taken during Audit Scotland fieldwork are from 2007/08.

Part 1. Introduction



NHS diagnostic activity has grown over the last four years.



Setting the scene

13. NHS staff use radiology, endoscopy and laboratory services to reach a diagnosis. Radiology departments provide various radiological procedures such as X-rays, CT and MRI scans as well as other forms of imaging such as ultrasound. Radiology services are provided from a range of locations including radiology departments within hospitals, emergency departments and, increasingly, outside hospitals, for example in primary care and mobile imaging facilities. In 2006/07, almost three million patients had a radiology test; of these, just under 800,000 patients had a CT, MRI, barium enema or ultrasound test.¹¹

14. Endoscopy involves looking inside the body by inserting a flexible tube with a camera inside it. Endoscopy procedures are usually performed in endoscopy units and are carried out by gastroenterologists, colorectal surgeons, GP endoscopists and nurse endoscopists, supported by endoscopy nurses and technicians.¹² Doctors from other specialties also use endoscopy units to provide diagnostic tests such as cystoscopies. Since 2003/04, there has been a ten per cent increase in endoscopy and cystoscopy procedures performed in Scotland (Exhibit 1). In 2006/07, NHS staff carried out almost 168,000 procedures. Between 2003/04 and 2006/07 there has been a slight increase, of two per cent, in endoscopy and cystoscopy procedures done as outpatients or day cases rather than inpatients.¹³

15. Laboratory services include a range of disciplines such as microbiology, haematology, clinical chemistry and histopathology. These disciplines carry out tests on blood and tissue samples to assist in diagnosis:

- Microbiology tests look for micro-organisms that cause diseases, for example, an MRSA test checks a sample of blood or a swab taken from a patient for the bacterial infection.
- Haematology tests a patient's blood, for example, a full blood count test checks for infection in the blood.
- Clinical chemistry looks at hormones and other chemicals in a patient's blood or fluids, for example, a thyroid function blood test checks for thyroid disorders.
- Histopathology processes tissue samples and fluids for any abnormalities, for example, a duodenal biopsy is where tissue is taken from a patient's

Exhibit 1

Diagnostic radiology and endoscopy attendances in Scotland over the period 2003/04 to 2006/07

Radiology and endoscopy activity has grown over the last four years.



Notes:

1. Data on ultrasound cover obstetric and non-obstetric ultrasound.
 2. Lower gastrointestinal procedures include sigmoidoscopy and colonoscopy procedures.
- Source: ISD Cost Book and SMR data

¹¹ The three million patients includes patients who had general X-rays and other types of radiology tests which were not part of the national diagnostic waiting times target. Data on ultrasound here include both obstetric and non-obstetric ultrasound. Data are from ISD Cost Book, apart from barium enema data (34,211 attendances) which are based on an extrapolation of data from our five sample boards that represent almost 60 per cent of the Scottish population.

¹² The glossary at Appendix 4 provides an explanation of the procedures.

¹³ ISD SMR data.

small intestine during an upper endoscopy procedure to check for abnormalities such as tumours or infection.

16. Approximately 60 per cent of diagnoses rely on laboratory services.¹⁴ Although these services are based mainly in hospital laboratories, a lot of the work is carried out for patients who are cared for by their GP or other primary care staff and not admitted to hospital. On average, a third of our sample boards' laboratory requests for these tests came from GPs.¹⁵ There has been an increase in laboratory activity in the last four years (Exhibit 2).

17. Clinicians often need a number of tests to help diagnose a patient's condition (Exhibit 3, overleaf). All services need to work together to ensure patients have quick access to treatment.

18. Audit Scotland published a review of waiting times for planned care in 2006. We found that, while the NHS in Scotland had made significant progress meeting waiting times targets, it would face major challenges in meeting more ambitious targets in the future and needed to develop longer term sustainable approaches to tackling waiting times.¹⁶ As part of this study, we looked at whether NHS boards are using sustainable initiatives to reduce diagnostic waiting times.

Policy background

19. In 2005, the Scottish Executive set up the Diagnostic Services Delivery Team. The team identified a number of common problems faced by diagnostic services including:¹⁷

- long waits for some tests to be carried out and for results to be reported

Exhibit 2

Laboratory activity 2003/04 to 2006/07 in Scotland

Laboratory activity has increased over the last four years.



Source: ISD Cost Book

¹⁴ *Acute Hospital Portfolio – Guide to Diagnostic Services*, Healthcare Commission, February 2006.

¹⁵ Based on Keele data on GP requests for clinical chemistry, histopathology, haematology and microbiology tests.

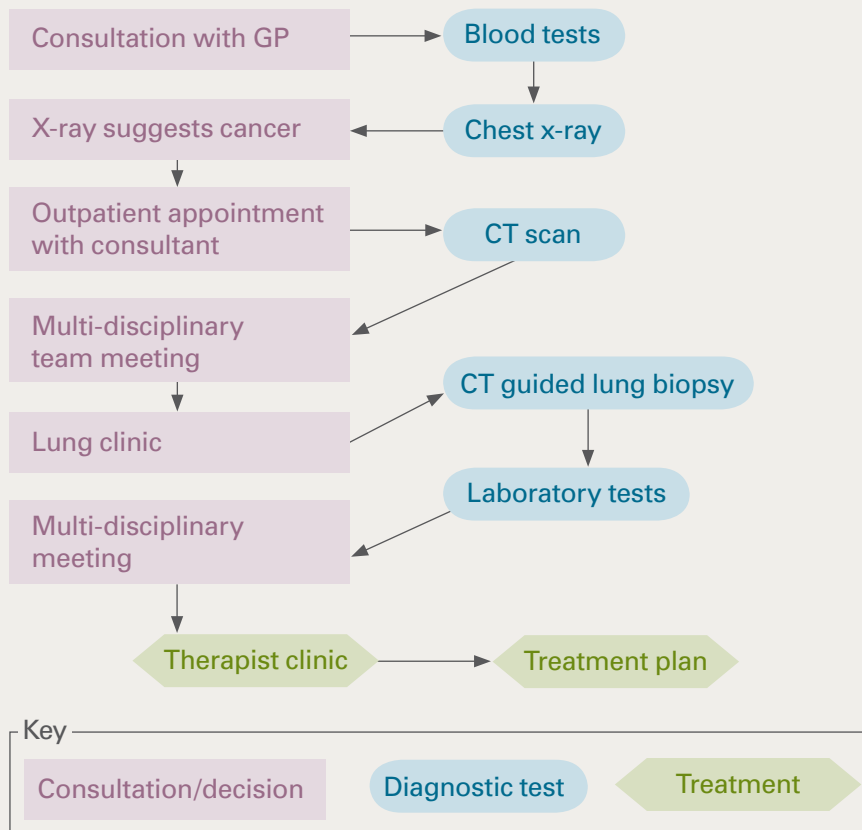
¹⁶ *Tackling waiting times in the NHS in Scotland*, Audit Scotland, February 2006.

¹⁷ *Diagnostic Services*, NHS Scotland National Framework Advisory Group, 2005. The Diagnostics Services Delivery Team was established by the Scottish Executive to consider key issues for the future development of service delivery.

Exhibit 3

Example of typical tests for diagnosing lung cancer

For many patients, diagnosis involves multiple tests provided by different services.



Source: Audit Scotland, modified from NHS Cancer Services Collaborative Improvement Partnership; Management of Patients with Lung Cancer, Guideline 80, Scottish Intercollegiate Guidelines Network, February 2005

- rising demand for tests created by new diagnostic technologies, new sources of referrals (such as new screening services) and demographic changes
- a perception that some referrals for diagnostic tests are inappropriate or unnecessary
- equipment that is in short supply, out of date or not always used to its full potential
- staff shortages and the need for better workforce planning and development
- variation in the quality, cost and efficiency of diagnostic services.

20. In June 2005, the Scottish Executive announced waiting times targets for eight key radiology and endoscopy diagnostic tests.¹⁸ This target was backed by £50 million of additional investment over three years to 2007/08.

21. In April 2006, the Scottish Executive established a two-year national programme, the Diagnostic Collaborative Programme, to help

NHS boards improve patient care and access to diagnostic services. The programme emphasised the need for the NHS in Scotland to make changes to how it organises and delivers diagnostic services, along with shorter term measures to meet national waiting times targets. To help NHS boards in this work, the Scottish Executive provided £4 million additional funding made available over three years up to 2007/08.

22. The Scottish Government has since set a new referral to treatment waiting times target that will affect diagnostic services.¹⁹ By the end of 2011, the time between any referral, diagnosis and a patient starting treatment should be no more than 18 weeks. Achieving this target will place further pressure on NHS boards to provide rapid, well-coordinated diagnostic services.

23. In 2004, the Scottish Executive announced a new system for defining and measuring waiting times, known as 'New Ways'. This system came into effect on 1 January 2008.²⁰ Information about waiting times should now be easier for patients to understand. As part of these changes, NHS boards must offer patients a minimum of two dates for appointments, and patients should get these offers at least three weeks in advance of the appointment. This includes appointments for diagnostic tests.²¹

24. *Delivering for Health* outlined plans for moving as much healthcare as possible from hospital to primary care, through extending the range of local healthcare services available to patients, including diagnostic tests. NHS boards are working with Community Health Partnerships (CHPs) to develop a wider range of local diagnostic facilities.²²

18 *Delivering for Health*, Scottish Executive, 2005.

19 There may be some exclusions to very specialised tests.

20 *New Ways* was announced in *Fair to All, Personal to Each*, Scottish Executive Health Department, December 2004.

21 *New Ways* does not apply to radiology services.

22 *Delivering for Health*, Scottish Executive, 2005.

Part 2. Improving the patient experience



NHS boards have made significant progress in reducing waiting times for tests and are getting better at meeting patient needs.

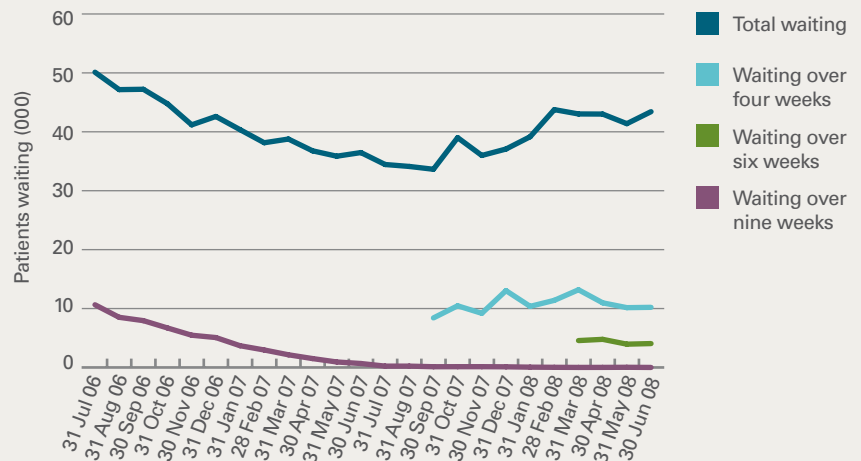
Key messages

- NHS boards have made significant progress in reducing waiting times for eight key radiology and endoscopy tests. The number of patients waiting more than nine weeks for a test fell from 10,638 at the end of July 2006 to two patients at the end of June 2008.
- Diagnostic services are getting better at meeting patient needs. Endoscopy units have made progress in providing a better quality service for patients. Almost three-quarters have improved on elements of patient aftercare.
- NHS boards could do more to provide convenient appointments to patients. Approximately half of the hospitals in our review offered patients the choice of date, time and location for endoscopy appointments. Fewer hospitals offered this choice for radiology tests.
- Radiology services performed well in how quickly they carry out inpatient scans: on average, nine out of ten CT scans were carried out within 24 hours of receiving the request from clinicians. On weekdays, almost three-quarters of MRI scans were performed within 24 hours of the scan request.
- There is variation in how quickly hospitals formally report test results. The median wait for routine outpatient MRI test results varied from one to five days. Laboratories also vary in how quickly they issue test results.

Exhibit 4

Diagnostic tests waiting times July 2006 to June 2008

The number of patients waiting over nine weeks for the eight key radiology and endoscopy diagnostic tests has fallen since July 2006.



Source: ISD waiting times data

The NHS in Scotland has reduced waiting times for the eight key diagnostic tests

25. NHS boards have made significant progress in reducing waiting times for the key diagnostic tests and were very close to achieving the nine-week target which was to be delivered by 31 December 2007. At the end of January 2008, only 52 patients had been waiting longer than the nine-week target compared with 10,638 patients at the end of July 2006. Data on waiting times for diagnostic tests were not collected centrally prior to July 2006, however, there is evidence that patients in some areas waited as long as 36 weeks for radiology scans and 26 weeks for endoscopy procedures.²³ Over the last two years, NHS boards have continued to reduce the number of patients experiencing long waits: at the end of June 2008, only two people had been waiting longer than nine weeks (Exhibit 4).

26. As a milestone in achieving the 18-week referral to treatment target, the Scottish Government stated that patients should not wait longer than six weeks for the eight key tests from March 2009.²⁴ Data on the number of patients waiting more than six weeks for a test have only been collected since March 2008. Since then, the number of patients waiting more than six weeks fell from 4,562 to 4,054 in June 2008. Although not a formal milestone, the Scottish Government collects data on the number of patients waiting four weeks or more for the diagnostic tests. This has risen slightly from 8,407 in September 2007, when these data were first collected, to 10,205 in June 2008.

27. Across Scotland, the total number of patients waiting for the eight key tests fell from 50,113 in July 2006 to 33,639 in September 2007. Monthly monitoring data show the total number waiting has increased since then: 43,417 patients were waiting for diagnostic tests in June 2008. NHS boards will need to continue improving

²³ ISD unvalidated and unpublished data on waiting times for diagnostic tests. All data are at month-end.

²⁴ This milestone is part of the Health Improvement for the people of Scotland, Efficiency and Governance, Access to Services and Treatment Appropriate to individuals (HEAT) targets.

waiting times if they are to achieve the milestone for the 18-week referral to treatment target. The Scottish Government continues to monitor waiting times for the key tests, and plans to add additional diagnostic tests to the monitoring data.

The quality of endoscopy services is improving

28. All acute and some community sites in Scotland are assessing the quality of endoscopy services using the Global Rating Scale (GRS). This tool is designed to assess how well endoscopy units provide a patient-centred service.²⁵ It assesses two main aspects of patient care: clinical quality and the patient experience. Within each aspect there are six elements ([Exhibit 5](#)).

29. The most recent census in April 2008, shows improvements in both patient experience and clinical quality since data were first collected in April 2006 ([Appendix 5](#)). For example, almost three-quarters of hospitals have improved on elements of patient aftercare. [Case study 1](#) outlines improvements NHS Lothian made after carrying out a patient satisfaction survey.

30. The NHS in England also uses the GRS system to monitor endoscopy services and performs better than the NHS in Scotland in all 12 elements ([Appendix 5](#)). English endoscopy units have been using the GRS system for a year longer than units in Scotland, but the difference in performance is marked for several elements of care.

Exhibit 5

Elements of the Global Rating Scale

The Global Rating Scale assesses endoscopy units' performance against two aspects of patient care, which cover the following 12 elements:

Patient experience	Clinical quality
Aftercare	Appropriateness
Booking	Comfort
Equality	Communication
Feedback	Consent
Privacy	Safety
Timeliness	Quality of procedure

Source: GRS Scotland

Case study 1

Improving endoscopy services following patient feedback

In 2007, the endoscopy department at the Western General Hospital in Edinburgh sent out questionnaires to ask what patients thought of its service. Patients had two main criticisms: firstly, the hospital asked all patients to arrive at the clinic at the same time, regardless of when their procedure was scheduled in the four hour session; and patients attending for an upper gastrointestinal (GI) procedure were being needlessly changed into backless hospital gowns when they arrived at the unit.

The endoscopy team changed the booking process so that patients receive staggered appointment times throughout the session and patients do not have to change into a gown when having an upper GI procedure. The department re-issued the patient survey in September 2007 and the results were much better. The department is continuing to seek patients' views on a regular basis.

Source: Adapted from *Delivering Better Care in Diagnostics*, Diagnostic Collaborative Programme, Scottish Government, 2008

Not all hospitals offer patients a choice of diagnostic appointment date and time

31. Traditionally, hospitals have issued patients with a fixed appointment date and time. But providing patients with choice helps reduce the number of appointments wasted by patients not attending. For example, by

providing choice of appointment date and time to patients waiting for a barium test, NHS Ayrshire and Arran reduced the percentage of patients who did not attend from 17 per cent in July 2006 to around seven per cent in October 2007.²⁶ The Diagnostic Collaborative Programme encouraged NHS boards to give patients choice in their appointment date and time for diagnostic tests.²⁷

²⁵ NHS Quality Improvement Scotland is responsible for monitoring performance against the Global Rating Scale.

²⁶ Diagnostic Collaborative Programme data.

²⁷ Patient-Focused Booking or partial booking was introduced for outpatient appointments in 2003 as part of national waiting lists management projects. This system provides patients with choice of date and time which can help when making necessary arrangements to attend the appointment.

32. Around half (nine out of 19) of the hospitals we reviewed offered patients a choice of an upper and lower endoscopy appointment date, time and location; 53 per cent (nine out of 17) offered choice for colonoscopy appointments; and 46 per cent (six out of 13) offered choice for cystoscopy appointments. Seventeen per cent of hospitals (four out of 23) offered patient choice for ultrasound appointment date, time and location, and fewer than ten per cent (two out of 21) offered choice for CT scans in 2006/07.²⁸ Some hospitals therefore continue to offer patients fixed appointment dates and times for radiology tests.

33. As part of New Ways, the new method for defining and recording waiting times, NHS boards must offer patients a minimum of two appointment dates, and all the offers should be made at least three weeks in advance of the appointment. This means patients have some say in choosing their appointment, but these changes apply to endoscopy and not to radiology services. The Scottish Government is aiming to extend New Ways to radiology services.²⁹ NHS boards have concerns about the impact of these new arrangements as giving at least three weeks notice for appointments might cause difficulties in achieving shorter waiting times for diagnostic tests.

On average, nine out of ten inpatient CT scans were carried out within 24 hours of the scan request

34. Diagnostic services should complete inpatient tests and pass the results to clinicians quickly so that:

- clinicians can decide how best to treat the patient
- patients can start treatment as soon as possible

- patients do not need to stay in hospital longer than necessary.

35. Data collected in April 2008 show radiology services performed well in carrying out inpatient CT scans within 24 hours of receiving the request from clinicians. Across the sample hospitals, the median was 89 per cent of CT scans performed Monday to Thursday and 93 per cent performed Friday to Sunday. The median across sample hospitals for CT scans completed within 48 hours was 100 per cent for both weekday and weekend.

36. MRI scans were not performed as quickly – the median was 73 per cent within 24 hours Monday to Thursday and 50 per cent Friday to Sunday. The median for those completed within 48 hours was 73 per cent Monday to Thursday, and 75 per cent Friday to Sunday.

37. Clinicians do not usually request scans for outpatients over the weekend, which might partly explain why those tests tend to be carried out quicker for inpatients over the weekend compared with during the week. Crosshouse Hospital is the only hospital in our sample that has CT services for routine outpatient work on a Saturday. Emergency or on-call MRI services are not as common as CT services: all our sample hospitals have formal on-call CT services over the weekend whereas only ten per cent have formal on-call for MRI. This also explains the variation in performance of the two tests.

There is potential to reduce the time between an examination taking place and a report being issued

38. Once a patient has received a radiology examination such as a CT scan, the radiologist or a trained radiographer interprets the image and then writes a report. This needs be

done as quickly as possible so the patient knows the reason for their symptoms and treatment can begin if necessary. The time taken between a radiology examination and when a formal report is sent to the clinician or GP who requested it is known as the turnaround time. Sometimes the radiologist reports back to the clinician informally before the formal report is issued. For patients referred by their GP, a formal report is very important as the GPs do not usually have access to the image.

39. Our data on median turnaround times for the following tests are based on a snapshot audit taken over a one-week period in April 2008. Some hospitals reported having low numbers of patients for particular tests in that week which may have had an impact on their median turnaround time.

Average turnaround times for radiology tests varied across hospitals

40. The median turnaround time for routine outpatient CT scans in each NHS board varied from less than one day to 4.5 days, and routine outpatient MRI scans varied from one to five days. Median turnaround times for GP-referred barium enemas varied from less than one day to 5.5 days. The longest median turnaround time for inpatient barium enemas was 11 days and the shortest was less than a day. The median turnaround time for inpatient CT scans varied from less than one day to three days.

NHS boards had difficulty providing information on the time it takes to report the results of an endoscopy procedure

41. Turnaround time for endoscopy procedures was the time from when a patient biopsy sample was taken during an endoscopy procedure, to when a formal report was issued. Laboratory services are involved in this process as they analyse the

²⁸ Data gathered through the NHSScotland Radiology Benchmarking Project and Audit Scotland fieldwork. Appendix 2 shows the services provided at each hospital.
²⁹ A national forum was set up to consider the application of New Ways to radiology and to explore the possibility of changing the three-week timescale for offering appointments.

sample. We found that laboratory and endoscopy information systems are not coordinated to provide this information: only five units were able to provide this information but these data were not comparable.

Laboratory average turnaround times varied across hospitals

42. We measured the time taken from when a sample was logged onto the laboratory system to when a formal report was issued. To make data as comparable as possible, we collected data on four types of laboratory tests: MRSA, full blood count, thyroid function and duodenal biopsy. The time reported, however, only covers part of the total turnaround time for many tests. There may be a delay between the sample being taken from a patient and transporting it to the laboratory and logging it onto the system but laboratories do not record this information. Laboratories found it difficult to extract these data as there are limitations in their management information. As with radiology tests, the results can sometimes be reported back to clinicians informally before they are logged onto the system. NHS boards were unable to identify how many of the tests during the sample period were reported in this way. In addition, tests are sometimes done in batches, which means laboratories wait until there are a certain number before processing them.

43. Counting the cells in a patient's blood to test the full blood count was traditionally performed manually but laboratories are now using special automated equipment which enables them to process these tests quickly. The median time to issue the results of outpatient full blood count tests ranged from five minutes to one hour.

44. The median time for an inpatient MRSA test, processed Friday to Sunday, ranged from approximately 18 hours to 2.5 days. Some hospitals use different procedures for testing for MRSA. For example, hospitals in North Glasgow use an approach to test for MRSA that provides a negative result within 18-24 hours and a positive result takes at least another 24 hours. Hospitals in South Glasgow use an approach that takes 42-48 hours for a negative result and an additional 24 hours for a positive MRSA result. The use of different approaches explains some of the variation in turnaround times, however, laboratories did not provide information on the number of samples that were tested for a positive result. We are not in a position to comment on the most appropriate approach but NHS boards need to ensure patients are managed appropriately as quickly as possible. A one-year pilot scheme for routine MRSA testing of patients on admission to hospital is currently under way in several hospitals across Scotland. This may have an impact on the type of approach laboratories use for MRSA testing. The results of the pilot will be available in spring 2009.³⁰

45. Median turnaround times for routine outpatient thyroid function tests processed Monday to Thursday ranged from approximately an hour and a half to almost two days. Median turnaround times for a routine outpatient duodenal biopsy processed Monday to Thursday ranged from two days to seven days.³¹

46. Processing routine diagnostic tests more quickly might not always result in a significant clinical benefit. However, long delays in reporting results have a negative effect on patients. As waiting times for referral to treatment get shorter, total turnaround times are even more important. The variation across NHS boards and within NHS boards for

routine testing suggests scope for improvement. NHS boards should develop local good practice guidelines on turnaround times for tests, reflecting clinical urgency, and regularly monitor performance against these.

Recommendations

NHS boards should:

- benchmark with endoscopy units across the UK which are returning better GRS scores to identify good practice that can be applied locally
- offer patients a choice of date and time for all elective diagnostic appointments
- set local targets for test turnaround times that reflect their clinical urgency, and monitor performance against these.

The Scottish Government should work with NHS boards to:

- develop guidelines on good practice turnaround times for diagnostic tests.

³⁰ *The clinical and cost-effectiveness of screening for methicillin-resistant Staphylococcus aureus (MRSA)*, NHS Quality Improvement Scotland, October 2007.
³¹ The snapshot audit data for duodenal biopsy turnaround times were based on a three-month period as these tests are carried out less frequently than the other laboratory tests we looked at.

Part 3. Approaches to improve diagnostic services



NHS boards have reduced waiting times through a mix of short-term initiatives and longer term improvements.



Key messages

- NHS boards are making progress in reducing inappropriate referrals but there is scope for improvement.
- Ninety per cent of hospitals take direct referrals from GPs for ultrasound, which means these patients do not need to wait to be seen at an outpatient clinic first.
- NHS boards have achieved the reductions to diagnostic waiting times by doing additional work funded by waiting list money and implementing longer term improvements to how they manage and deliver services. Achieving future waiting times targets will be challenging.
- NHS boards need to ensure that all services involved in delivering patient care are planned in a joined-up way. This includes diagnostic services.

NHS boards have implemented many of the changes encouraged by the Diagnostic Collaborative Programme

47. All NHS boards in our sample have taken longer term steps to change how they manage and deliver services, many of which were promoted by the Diagnostic Collaborative Programme. Making these changes has helped NHS boards to improve the effectiveness of services, for example, by having quicker patient access to the services.

48. Most NHS boards have made changes to how they manage diagnostic services, such as pooling consultants' lists. Almost three-quarters of our sample hospitals pool waiting lists for patients referred to consultant radiologists and 95 per

Case study 2

Process mapping in radiology

The Royal Alexandra Hospital in Paisley mapped the processes involved in providing MRI services, from when the department received a patient referral to when the hospital discharged the patient. It identified more than 51 steps before the scan result was available and that some of the stages caused delays for patients. Some tasks were duplicated and unnecessary, and the administrative process was understaffed.

The MRI service recruited additional staff and reduced the number of steps in the process to 32, which means patients get the results more quickly.

Source: Adapted from *Delivering Better Care in Diagnostics*, Diagnostic Collaborative Programme, Scottish Government, 2008

cent pool lists for patients referred to consultants for upper and lower endoscopy procedures. This means patients are referred to the diagnostic service instead of an individual consultant, helping to reduce the time patients have to wait.

49. All NHS boards in our sample have extended their working day, for instance, by working over lunchtime to increase the number of radiology and endoscopy sessions available. However, we found variation in the number of hours that services were open; the hours that endoscopy staff spent carrying out procedures, known as scoping hours, varied from 31.5 hours at the Victoria Infirmary to 40 hours per week at Royal Infirmary of Edinburgh and the Western General Hospital.

50. Looking at all the stages involved in a typical patient's care is a good way of identifying any problems or unnecessary steps. All the sample NHS boards mapped their radiology and endoscopy services to identify bottlenecks or unnecessary steps and make changes to improve the process ([Case study 2](#)). Some NHS boards also did this for laboratory services, for example NHS Lanarkshire mapped its pathology services and, as a result, recruited additional staff to deal with increasing workload.

NHS boards are taking measures to manage demand for diagnostic services but can do more

51. The increase in demand for diagnostic services is driven by improvements in other clinical areas, for example, the new bowel cancer screening programme and the introduction of new national guidelines.³² Services are also under increasing pressure as the NHS delivers the cancer and emergency department waiting times targets.³³ NHS boards should know the source and level of demand for diagnostic tests to ensure the right staff and equipment are available. If NHS boards are aware of the source of demand, they can take measures to ensure it is appropriate. For example, most of our sample boards are taking measures to help reduce unnecessary demand for radiology services by checking referrals to make sure they are appropriate.

52. All endoscopy units in our sample had referral guidelines in place when the GRS scheme started in Scotland in April 2006.³⁴ Referral guidelines aim to help GPs and hospital clinicians make decisions about the right care for certain medical problems, for example, deciding which diagnostic test is most suitable. Data from

32 For example, Scottish Intercollegiate Guidelines Network (SIGN) guidelines on diagnosis and management of head and neck cancer published in November 2006.
33 The target of a maximum wait of 62 days from urgent referral to treatment for patients with cancer was initially set in 2001. This was to be delivered by the end of 2005. The national target for emergency departments is that patients should wait no longer than four hours between arriving at an accident and emergency unit and admission, discharge or transfer, unless there are stated clinical reasons for keeping them in the unit. This was to be delivered by the end of 2007.
34 Global Rating Scale Scotland data, April 2006.

April 2008 show that approximately two-thirds of these units have taken additional steps to manage inappropriate referrals, including providing feedback to GPs about the appropriateness of tests they have ordered. Around a third of the units, however, have not taken any additional steps.

53. About 35 per cent of the sample boards' laboratory activity came from primary care in 2006/07.³⁵ Four of our sample boards have GP referral guidelines in place to help reduce unnecessary demand for laboratory tests, and two boards, NHS Lanarkshire and NHS Greater Glasgow and Clyde, feed information back to GPs on rates of referral (*Case study 3*).

Most hospitals take direct referrals from GPs for at least one radiology test

54. GPs referring patients directly for radiology tests reduces waiting times as it avoids patients having to attend an outpatient clinic first. Ninety per cent of the hospitals we reviewed had direct referral for ultrasound tests in 2006/07, compared with 93 per cent of trusts in England in 2005/06.³⁶ Fewer hospitals in Scotland take GP direct referrals for CT and MRI. In 2006/07, only 29 per cent of sample hospitals (six out of 21) accepted direct referral for CT scans and only seven per cent (one out of 15) for MRI scans.³⁷ In England, 49 per cent of NHS trusts took referrals for CT from GPs and 34 per cent for MRI in 2005/06.³⁸ There is scope for more patients in Scotland to be referred directly by GPs for diagnostic tests through clear guidelines to ensure referrals are appropriate (*Case study 4*).

There are unexplained differences across NHS boards in the rate of referrals for diagnostic tests

55. We found wide variation in the demand for diagnostic tests across the sample boards. For example, the number of haematology requests per

Case study 3

Reducing unnecessary demand for laboratory services

NHS Greater Glasgow and Clyde has started a joint project with Community Health and Care Partnerships (CHCPs) to reduce unnecessary demand for laboratory services. As part of this work, monthly reports are sent to GP practices outlining the top eight profiles of most commonly requested haematology and biochemistry tests. Information on the rate of tests that have been repeated for the same patient is also provided to the practices.

NHS Greater Glasgow and Clyde has worked with nine pilot GP practices to develop a Primary Care Handbook. This is to guide GPs in decisions about the right tests to request for certain medical conditions. All test results for haematology, biochemistry and pathology are available to GPs through the Scottish Care Information system (SCI store).

Source: Audit Scotland fieldwork, 2008

Case study 4

GP direct referral to CT scans in NHS Lanarkshire

In 2007, GP practices in NHS Lanarkshire identified delays for patients they were referring for investigation of neurological conditions. GPs had to refer patients to see a consultant at an outpatient clinic first and patients then waited up to 17 weeks for an outpatient appointment. At the outpatient clinic, consultants would then refer patients to hospital for a CT brain scan.

In consultation with local GP representatives, the radiology departments developed a protocol to enable GPs to refer patients directly for CT brain scans. This helps clinicians to make a faster diagnosis and patients can start treatment quicker. In November 2007, patients referred directly by GPs waited only three weeks for a CT scan.

Source: Adapted from *Delivering Better Care in Diagnostics*, Diagnostic Collaborative Programme, Scottish Government, 2008

head of board registered population carried out by NHS Lothian in 2006/07 was 1.27 compared to 1.92 in NHS Greater Glasgow and Clyde. The total number of radiology referrals per head of board registered population also varied, from 0.62 in NHS Lothian to 0.73 in NHS Greater Glasgow and Clyde. Variation in demand will always occur as the needs of the local populations differ among NHS boards but without further investigation it is not possible to say whether this would account for all the variation we identified. NHS boards should collect information on the source and level of

referrals to diagnostic tests, and work with GPs and clinicians to develop written or electronic local referral guidelines for tests.

£50 million was allocated to NHS boards to support improvements in diagnostic waiting times

56. In 2005/06, the Scottish Executive made £50 million additional funding available to support NHS boards in achieving the nine-week target for radiology and endoscopy diagnostic tests. The funding was allocated based on the Arbuthnott formula

35 Keele Benchmarking data. This does not include NHS Orkney.

36 *An improving picture? Imaging services in acute and specialist trusts*, Healthcare Commission, 2007. Data for England are from 2005/06.

37 These were referrals for CT scans of the brain only and MRI spine scans only.

38 *An improving picture? Imaging services in acute and specialist trusts*, Healthcare Commission, 2007.

and was for three years.³⁹ This way of allocating funding was to allow NHS boards to invest in longer term solutions, for example recruiting endoscopy staff, rather than just spending money on extra one-off increases in activity. One-off initiatives can help NHS boards clear a backlog of patients on a waiting list and help achieve waiting times targets but are not sustainable in the longer term.

57. One of the recommendations Audit Scotland made in its review of waiting times for planned care was that the Scottish Executive should ensure NHS boards' bids for waiting times funding include evidence of how they would use the money to achieve longer term sustainable reductions in waiting times.

58. The allocation of funding for diagnostic waiting times was linked to NHS boards' performance in meeting the diagnostic waiting times target and their participation in the Diagnostic Collaborative Programme. In addition, the Scottish Government assessed NHS boards' plans to ensure they included evidence of using the money to fund sustainable approaches to improving services.

59. NHS boards reported to the Scottish Government, in year-end reports, how they spent the additional funding which had been split between capital and revenue allocations.⁴⁰ Between 2005/06 and 2007/08, NHS boards in Scotland reported spending approximately £28 million additional capital funding on items such as radiology equipment or extending endoscopy facilities.⁴¹ NHS boards also reported spending approximately £22 million additional revenue funding over the three-year period.⁴² NHS boards used the money

to fund specific one-off initiatives, for example, hiring a mobile MRI scanner and initiatives that should have longer term improvements, for example, training radiographers to take on extended roles.

60. The Scottish Government found it difficult to separate out the exact amount NHS boards spent on these different types of initiatives, but it estimated that around a third of the revenue money was spent on short-term initiatives and around two-thirds was spent on longer term initiatives. However, it is not always clear how some of the initiatives they classified as longer term would result in sustainable improvements. For example, NHS boards spent money on providing additional endoscopy sessions on a regular basis over 2006/07 but it was not obvious from the information that all the recurring initiatives would achieve sustainable longer term improvements.⁴³ In the NHS boards we reviewed, 52 per cent of endoscopy services and 60 per cent of radiology departments ran occasional extended services in 2006/07 funded by waiting list money. Thirty per cent and 12 per cent respectively reported running sessions as part of regular extended hours, funded by waiting list money.

61. Nevertheless, we found evidence of NHS boards developing new ways to better organise diagnostic services and many examples of NHS boards using the money to invest in initiatives that should deliver sustainable solutions, such as employing new members of staff.

Meeting the new referral to treatment target will be challenging for NHS boards

62. Achieving and maintaining the milestone of six weeks for diagnostic tests will place NHS boards in a better position to meet the overall target of 18 weeks from referral to treatment. Between the end of January 2008 and the end of June 2008, 123 patients across Scotland waited longer than the nine-week target. Nine NHS boards had more patients waiting for the eight key tests in June 2008 than they did at the start of the year. There is a risk it will become more difficult to maintain shorter waits if the number of patients on waiting lists for diagnostic tests continues to increase.

63. NHS boards are making progress in implementing changes to how they manage diagnostic services to deliver improvements in the longer term. As well as reducing the different elements of a patient's wait, such as waits for outpatient appointments and diagnostic tests, NHS boards must plan all services in a joined-up way. NHS boards need to take account of how changes in one part of the healthcare system impact on another. For example, there was evidence of some NHS boards running additional and unplanned outpatient clinics to meet the outpatient waiting times target, generating additional diagnostic tests which had an impact on waiting times for radiology and endoscopy tests.

64. Smaller boards were concerned that as the waiting times become shorter, any unexpected increase in demand or, for example, equipment breakdown, may make it difficult to achieve the waiting times target

39 The Arbutnott formula is used to set the overall level of funding received by boards to provide health services. It takes into account differences between areas in the health of the population, deprivation and the additional cost of providing services in rural areas.

40 Capital expenditure is described as spending on items of £5,000 or more where the benefit lasts more than 12 months. Generally this will be spending on assets such as equipment as these can be used over a long period of time.

41 Based on data provided by the Health Delivery Directorate of the Scottish Government.

42 Revenue expenditure is described as spending on running services from day to day, for example, staff pay costs.

43 In some cases NHS boards and the Scottish Government classed initiatives that occurred more than once during the period of the diagnostic waiting times programme as recurring initiatives.

without increasing surplus capacity. NHS boards need to monitor demand and work together to put in place contingency plans to deal with unanticipated events.

Recommendations

NHS boards should:

- pool waiting lists for diagnostic radiology and endoscopy tests across consultants
- put in place protocols and referral guidelines to ensure referrals for diagnostic tests are appropriate
- collect and monitor information on the source and level of demand for diagnostic tests, and feed referral rates back to GPs and clinicians
- increase the range of diagnostic tests that GPs can refer patients for directly through clear protocols
- ensure that diagnostic services are included in longer term planning for achieving and maintaining the new 18-week referral to treatment target.

The Scottish Government should:

- ensure NHS boards share referral guidelines and templates to avoid duplication of work.

Part 4. Efficiency of diagnostic services and performance management



There is scope for NHS boards to use existing resources more efficiently.



Key messages

- There are inconsistencies in the way NHS boards count laboratory and radiology activity and how they calculate costs, making it difficult to compare published data. There are no national data available on the cost of an endoscopy test so we cannot compare this across NHS boards. The NHS needs better information for management purposes and to be able to compare the efficiency of diagnostic services across Scotland.
- The use of staff and equipment varies across laboratories, radiology departments and endoscopy services. There is scope for NHS boards to use existing resources more effectively.
- There are differences across laboratories in the numbers of repeat tests performed on the same patient. While some may be clinically justified, the level of variation suggests unnecessary testing.
- Around one in ten scheduled endoscopy sessions were not used in 2006/07, although over a third of our surveyed hospitals were unable to provide this information.

National data are not robust enough to estimate potential savings from improved efficiency

65. We looked at a range of efficiency indicators including unit costs, productivity and measures of the intensity with which hospitals use resources such as diagnostic equipment ([Appendix 3](#)). The data show scope to improve efficiency but are not robust enough to estimate potential savings. There are no national data on the cost of providing endoscopy services.

The NHS in Scotland needs better information to manage diagnostic services

66. There is national and board-level work to improve the information needed to assess performance, but data quality and the lack of standard definitions were issues throughout our review. We found gaps in basic information which is crucial to support capacity planning and management, such as the use of radiology and endoscopy sessions, or turnaround times for tests. NHS boards need better management information to ensure they are making best use of diagnostic resources.

There are inconsistencies in the information NHS boards provide on radiology and laboratory activity and costs

67. The NHS has improved data on radiology services in recent years. All of our sample boards have now installed a new Radiology Information System which has Scotland-wide coverage. This has helped agree a common definition for the data that the Scottish Government needs to monitor diagnostic waiting times.

68. The NHSScotland Radiology Benchmarking Project, set up as part of the National Benchmarking Project, is working to develop comparative performance information. 2006/07 was the first year of data collection and work is needed to refine this dataset. These data have highlighted how NHS boards count examinations differently; for example, in some hospitals a CT scan of a patient's chest, abdomen and pelvis is counted as one examination but other hospitals count this as three. This makes it difficult when making comparisons on indicators of efficiency such as the number of examinations per radiologist. There is an urgent need to standardise the way NHS boards count radiology activity to enable better comparisons.

69. The ISD Cost Book is the only published source of the cost of providing radiology services. It calculates the cost per radiology attendance across hospitals and NHS boards. In 2006/07, the median total cost of a CT attendance reported in the Cost Book was £108.60, the median cost of a MRI scan was £150.37 and ultrasound was £44. We compared activity data gathered through the NHSScotland Radiology Benchmarking Project with activity data in the ISD Cost Book and this shows significant inconsistencies in the way NHS boards complete the Cost Book submission. Activity in the Cost Book is reported as the number of attendances but some NHS boards submit the number of examinations instead ([Exhibit 6](#)). Given these inconsistencies, it is difficult to make comparisons of the cost per attendance across NHS boards. Higher costs are to be expected at boards with specialist services, for example, NHS Greater Glasgow and Clyde and NHS Lothian provide paediatric and neurosurgical services and this work involves complex diagnostic and interventional work.

70. Laboratory information systems differ greatly across NHS boards. As with radiology, there is a need to standardise how activity is counted and to harmonise data coding across the different systems to enable better comparisons of efficiency.

71. All laboratory departments in Scotland are now participating in the Keele University Benchmarking Scheme, as recommended in *Delivering for Health*. 2006/07 was the first year most Scottish laboratories participated in the scheme, and work is ongoing to refine the dataset and fully develop a Scottish cohort within this programme.

Exhibit 6

Comparison of ISD Cost Book data on CT and MRI services and data gathered through NHSScotland Radiology Benchmarking Project, 2006/07

There are differences in the way NHS boards report radiology activity.

	CT			MRI		
	Cost Book	Radiology Benchmarking data		Cost Book	Radiology Benchmarking data	
	Number of patient attendances	Number of patients examined	Number of examinations	Number of patient attendances	Number of patients examined	Number of examinations
NHS Ayrshire & Arran	13,215	13,009	18,733	6,701	6,560	6,942
Pan Glasgow	81,057	51,298	80,466	24,995	20,129	23,501
Pan Clyde	13,567	13,809	14,833	6,576	4,822	5,466
NHS Lanarkshire	21,849	17,106	33,297	6,726	6,252	7,941
NHS Lothian	42,680	INA	43,729	16,554	INA	17,483

Notes:

1. NHS Greater Glasgow and Clyde provided data on hospitals in Glasgow and Clyde separately. These are presented as Pan Glasgow and Pan Clyde.

2. INA – information was not available.

Source: ISD Cost Book & NHSScotland Radiology Benchmarking Project

There is variation among laboratory services in the cost of carrying out a laboratory test

72. We based laboratory cost comparisons on the more robust Keele Benchmarking submissions.⁴⁴ NHS Orkney did not participate in the Keele Benchmarking Scheme in 2006/07 (Case study 5, overleaf). In total, the other four sample boards spent more than £111 million providing five laboratory disciplines in 2006/07.⁴⁵

73. For every request it receives, a laboratory may carry out a number of different tests. There was variation among sample NHS boards in:

- the number of tests carried out on each request in 2006/07 (Exhibit 7, page 23)⁴⁶
- the unit cost of carrying out a request and test.

74. We found no pattern between the number of tests performed on each request and the associated costs. For example, NHS Ayrshire and Arran carried out 11.1 tests for every clinical chemistry request with a total cost per request of £5.43; NHS Lothian carried out 7.2 tests with a total cost per request of £5.32 and NHS Greater Glasgow and Clyde carried out 9.9 tests per clinical chemistry request with a cost of £7.68 per request.

75. We found variation in the total cost of completing haematology requests and tests (Exhibit 7). The cost of a request varied from £4.61 in NHS Lothian to £7.12 in NHS Lanarkshire. The total cost per haematology test varied from £2.51 in NHS Lothian to £3.71 in NHS Greater Glasgow and Clyde. The total cost per histopathology and cytology slide varied from £15.24 in NHS Ayrshire and Arran to £18.16 in NHS Greater Glasgow and Clyde.⁴⁷

76. NHS Greater Glasgow and Clyde also shows the highest cost for completing a microbiology request at £10.11, and NHS Lanarkshire the lowest at £6.04 (Exhibit 8, page 24). The cost of completing a laboratory test can be broken down into two main elements: the cost of the staff and the non-staff cost, for example consumables such as chemicals. NHS Greater Glasgow and Clyde has the highest staff cost in our sample, at £8.24 per microbiology request, but the lowest consumables cost at £1.86 (Exhibit 8). Higher costs are to be expected for hospitals with a more complex case-mix, such as teaching hospitals, however, there is still variation when we compared two teaching hospitals. NHS Greater Glasgow and Clyde has more laboratory sites than any other NHS board which might explain some of the variation in staff costs. It has plans to centralise services on fewer sites by 2011 and has projected lower unit costs as a result.

⁴⁴ Keele data for 2007/08 were not available at the time of writing this report.

⁴⁵ These disciplines are haematology, microbiology, clinical chemistry, histopathology and cytology. Keele Benchmarking Scheme provided cost data for histopathology and cytology together. NHS Lanarkshire did not provide histopathology cost data to Keele in 2006/07.

⁴⁶ Keele does not report the number of microbiology tests, so we cannot look at number of tests per request for this discipline.

⁴⁷ Keele Benchmarking Scheme provided histopathology and cytology costs together.

Case study 5

NHS Orkney's diagnostic services

Healthcare services in remote and rural areas such as Orkney are often delivered in a different way to services in other parts of Scotland and it is not always appropriate to present direct comparisons.

The laboratory facilities and equipment at Balfour Hospital were updated in 2001, which means the laboratory staff can carry out a lot more tests. Previously many of these tests had to go to NHS Grampian. Clinical chemistry, microbiology and haematology laboratory work is processed on the island and only histopathology work is sent to NHS Grampian. NHS Orkney did not participate in the Keele Benchmarking Scheme in 2006/07, and therefore we could not calculate many of the indicators of efficiency such as the cost per test. We did, however, gather data directly from Balfour on the number of repeated laboratory tests, which we cover in paragraphs 89 – 92.

Patients in Orkney who need a MRI or CT scan travel to Aberdeen to receive these services. The NHS board is currently exploring the possibility of using NHS Shetland's CT scanner.

NHS Orkney provides ultrasound and barium studies at Balfour Hospital. These services are provided through a mix of on-site and visiting staff. In 2006/07, 1.8 whole time equivalent (WTE) on-site radiographers undertook 1,720 non-obstetric ultrasound examinations. This included preparing the patients, taking the image and, for 90 per cent of the cases, reporting the results. Across the sample hospitals, this was the highest rate for radiographers independently reporting scans. Only ten per cent of the

scans were sent to consultant radiologists in Aberdeen to interpret the results.

Consultant radiologists from NHS Grampian visit Orkney every six weeks, for two days, to undertake the barium work. In 2006/07, 65 barium enemas were performed. Non-obstetric ultrasound and barium activity accounted for around two per cent of procedures carried out at bigger NHS boards in our sample. With lower levels of activity at NHS Orkney, the number of weighted examinations per WTE radiographer appeared lower than the other NHS boards. To ensure compliance with the European Working Time Directive, NHS Orkney needs a certain level of staff to maintain the radiology service.

Like many of the sample hospitals we reviewed, the radiology department at Balfour takes direct referrals from GPs for ultrasound tests, which means patients do not need to wait to be seen at an outpatient clinic first. The rate of direct referral in 2006/07 in NHS Orkney was 62 per cent, which is double the rate of the next highest hospital in our sample.

Balfour does not have a dedicated endoscopy unit, therefore procedures are performed in the main theatre. Endoscopy and cystoscopy work is carried out by two consultant general surgeons. In 2006/07, consultants carried out 500 endoscopy and cystoscopy procedures. Due to the nature of providing an island service, these staff are also responsible for undertaking other duties such as preparing the patients and clerical work. With fewer total staff numbers in the endoscopy service, NHS Orkney appears to have a very high number of procedures per total staff.

Source: Audit Scotland fieldwork, 2008

We found unexplained variation among hospitals in the productivity of radiology, endoscopy and laboratory staff

77. Comparing how NHS boards use resources needs to take account of variations in the range and complexity of the diagnostic procedures carried out in different hospitals. For example, a MRI scan needs more resources than an ultrasound test.

Radiology staff productivity differs across NHS boards

78. We used a weighting system that reflects the relative effort of radiology examinations: the system allows for differences in case-mix by broadly weighting the examinations according to the amount of resources hospitals need to carry them out, although this system needs to be updated to reflect advances in technology.⁴⁸

79. In 2006/07, qualified radiologists at NHS Ayrshire and Arran carried out more than a third more weighted examinations than radiologists in Clyde hospitals ([Exhibit 9, page 25](#)).⁴⁹ Given the inconsistencies in the way in which NHS boards count activity, we also calculated the weighted number of radiology patient attendances per whole time equivalent radiologist.⁵⁰ Performance ranged from 25,534 weighted

48 The Körner weighting system was also used by the Healthcare Commission to weight radiology activity in its 2005 review of imaging services. The Körner system was developed in the mid 1990s and does not reflect recent technology advances. However, there is no other agreed up-to-date weighting system.

49 This relates to the four key radiology tests we looked at as part of this review.

50 A radiologist is a medically qualified doctor who specialises in the use of imaging techniques such as CT scans. A radiographer is a non-medically qualified person who assists the radiologist by taking the image.

Exhibit 7**Number of clinical chemistry, haematology, histopathology and cytology requests, tests and cost of each, 2006/07**

There is variation in the cost per test and cost per request.

Clinical chemistry					
NHS board	Requests	Tests	Tests per request	Cost per request	Cost per test
NHS Ayrshire & Arran	544,394	6,035,481	11.1	£5.43	£0.49
NHS Greater Glasgow & Clyde	2,370,857	23,576,521	9.9	£7.68	£0.77
NHS Lanarkshire	986,008	9,175,921	9.3	£5.78	£0.62
NHS Lothian	1,343,462	9,619,232	7.2	£5.32	£0.74

Haematology					
NHS board	Requests	Tests	Tests per request	Cost per request	Cost per test
NHS Ayrshire & Arran	511,579	794,214	1.6	£4.91	£2.93
NHS Greater Glasgow & Clyde	2,288,115	4,224,645	1.8	£6.97	£3.71
NHS Lanarkshire	808,405	1,666,688	2.1	£7.12	£3.45
NHS Lothian	1,020,563	1,844,511	1.8	£4.61	£2.51

Histopathology and cytology					
NHS board	Requests	Slides	Slides per request	Cost per request	Cost per slide
NHS Ayrshire & Arran	49,754	143,554	2.9	£43.98	£15.24
NHS Greater Glasgow & Clyde	206,582	903,987	4.4	£79.45	£18.16
NHS Lanarkshire	82,309	259,005	3.1	INA	INA
NHS Lothian	145,148	366,357	2.5	£42.40	£16.80

Notes:

1. INA – NHS Lanarkshire did not submit histopathology costs in 2006/07.

2. Keele Benchmarking Scheme provided cost data for histopathology and cytology together.

Source: Keele Benchmarking Scheme and Audit Scotland fieldwork

attendances in NHS Lanarkshire to 40,821 in NHS Ayrshire and Arran (Exhibit 9). Radiographers are taking on extended roles which means they both take and report the image; the level of radiographer input therefore might explain some of the variation in radiologists' productivity. We found that radiographers in nine out of ten

sample hospitals report ultrasound scans without the assistance of a radiologist. This varied from 20 per cent to 90 per cent of all ultrasound work carried out at sample hospitals in 2006/07. However, none of the radiographers across the sample boards reported CTs, MRIs or barium tests without assistance during that

period. Productivity of radiographers across the sample hospitals also varied. The number of weighted patient attendances per whole time equivalent radiographer ranged from 5,103 in NHS Lanarkshire to 7,577 in NHS Ayrshire and Arran (Exhibit 9).

80. Lower levels of activity in relation to numbers of staff suggest scope for improvements in the way staff are used to perform radiology tests. However, to better compare the productivity of staff in hospitals across NHS boards, examinations need to be counted in a consistent way and weightings need to be updated to reflect the resources, for example, the different staff that hospitals use to carry out radiology work. In addition, NHS boards need to ensure the ratio of staff to activity is sufficient to maintain the appropriate quality of patient care. The NHSScotland Radiology Benchmarking exercise did not collect data on quality indicators, for example, numbers of repeat tests.

81. We found a correlation between a lower rate of patients who did not attend for tests (DNA rate) and higher radiologist and radiographer productivity. For every 0.5 per cent reduction in DNA rates, radiographers performed 500 additional weighted examinations in 2006/07. As discussed in Part 3, NHS boards can take steps to reduce the number of patients who do not attend by providing patients with more convenient appointments. This can reduce wasted appointment slots and directly increase productivity.

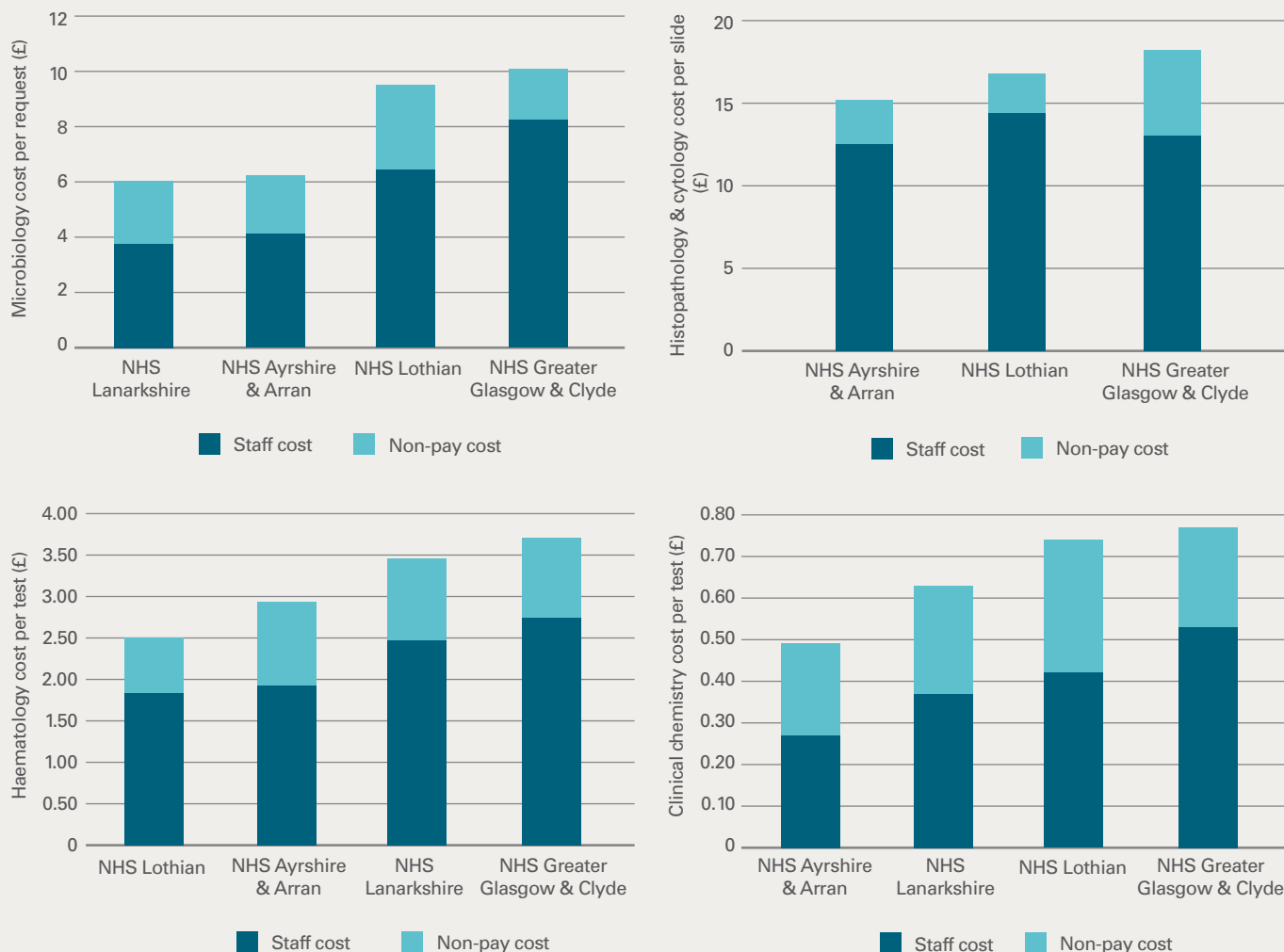
Productivity of laboratory staff varied among NHS boards

82. Registered biomedical scientists at NHS Ayrshire and Arran handled twice as many clinical chemistry tests as those in NHS Greater Glasgow and Clyde and NHS Lothian (Exhibit 10). Some of this variation can be explained by differences in the type and complexity of work that clinicians and GPs refer to the laboratory. NHS Greater Glasgow and Clyde and NHS Lothian are teaching boards and tend to carry out more complex work on laboratory samples than, for example,

Exhibit 8

Cost per test or request by laboratory discipline, 2006/07

Unit costs vary across four sample boards.



Notes:

1. NHS Orkney did not participate in Keele Benchmarking Scheme in 2006/07, NHS Lanarkshire did not submit histopathology costs in 2006/07.

2. Keele Benchmarking Scheme provided cost data for histopathology and cytology together.

Source: Audit Scotland fieldwork based on Keele Benchmarking Scheme data

NHS Ayrshire and Arran.⁵¹ We found the greater the proportion of requests from GPs, the higher the laboratory productivity. A higher proportion of laboratory work in NHS Ayrshire and Arran came from GP requests than in NHS Greater Glasgow and Clyde in 2006/07. As discussed in [Part 3](#), NHS boards should take steps to ensure referrals are appropriate, by putting in place clear referral guidelines.

83. Laboratory work, in particular clinical chemistry and haematology, is becoming more automated, for example, using technology to log, label or process a sample rather than doing this manually. The level of automation may also have an effect on the productivity of laboratory services. Requests from GPs tend to be less complex. This can mean more automated tests can be carried out on GP requests, compared with

more complex requests from hospital clinicians.

There is wide variation among hospitals in the number of procedures endoscopy staff carried out

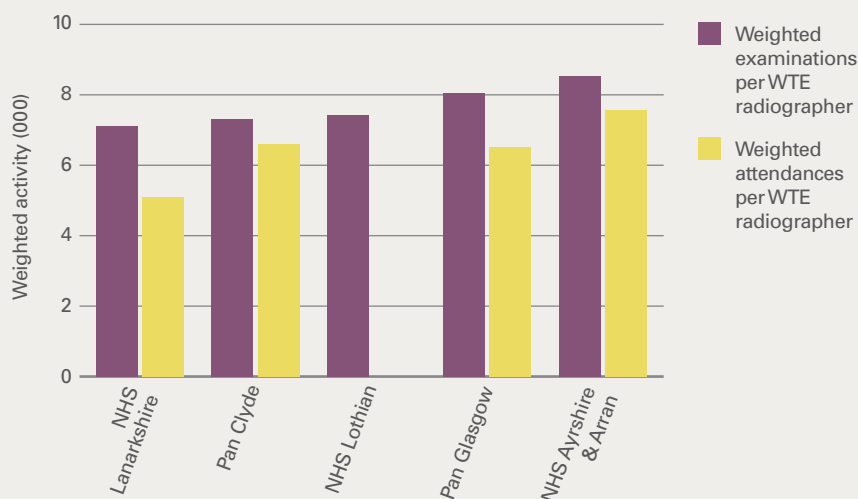
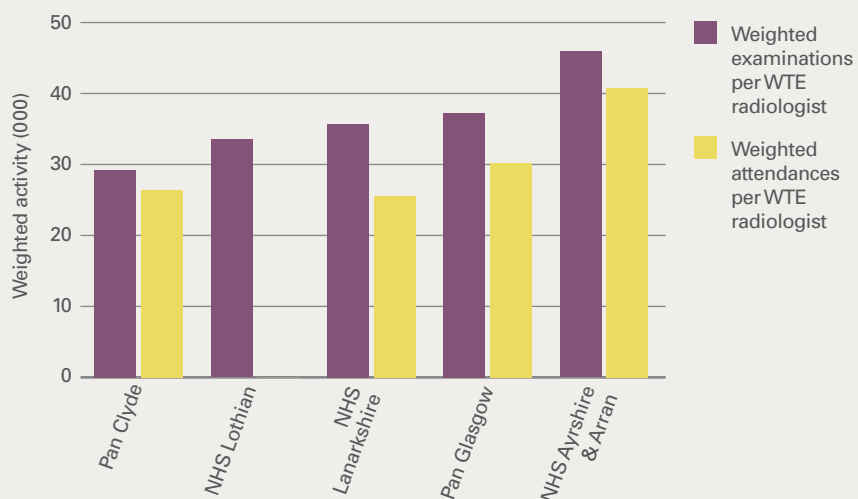
84. We also used a weighting system to take account of case-mix in endoscopy workload. For example, a sigmoidoscopy typically takes 20 minutes whereas a colonoscopy

51 NHS Greater Glasgow and Clyde hosts the National Centre for Bone Marrow Transplant, Paediatric Haemodialysis, Renal Transplant and an Oncology centre, which increases the complexity of clinical chemistry and haematology.

Exhibit 9

Examinations and patient attendances per whole time equivalent qualified radiologist and radiographer, 2006/07

Weighted productivity varies across hospitals for radiologists and radiographers.



Notes:

1. We used the Körner weighting system to weight the four key radiology tests carried out by these boards.
2. NHS Lothian was not able to provide the number of attendances for radiology services for 2006/07.
3. NHS Greater Glasgow and Clyde provided data on hospitals in Glasgow and Clyde separately. These are presented as Pan Glasgow and Pan Clyde.
4. The staffing figure does not include trainees.

Source: Audit Scotland fieldwork based on NHSScotland Radiology Benchmarking Project data.

typically takes 40 minutes⁵² We found variation in staff productivity among endoscopy units in 2006/07. The lowest number of weighted procedures per total whole time equivalent endoscopy staff was 176 at Vale of Leven Hospital and the highest was 446 at Hairmyres Hospital.^{53, 54}

The average across sample units was 309. We found that the type of hospital, for example a district general or teaching hospital, had an effect on productivity but this did not explain all the variation. Staff at the Royal Infirmary of Edinburgh, which is similar in size to Gartnavel General

Hospital, carried out less than half as many procedures.⁵⁵ We found no significant association between the productivity of total staffing and the type of staff that carried out the sessions. NHS boards need to fully understand the reasons for high or low staff productivity and ensure there is no room for further improvements.

The intensity with which hospitals use endoscopy facilities varies

On average, Scottish hospitals carried out more weighted procedures per endoscopy room than English hospitals **85**. The number of weighted procedures performed in each room of endoscopy units varied across hospitals in 2006/07. The average number of endoscopy procedures carried out in each room was 2,738, which was more than the English average of 2,340 in 2005/06. The lowest number of procedures performed in each room in 2006/07 was 1,864 at the Leith Community Centre, and the highest was 4,488 at St John's Hospital (Exhibit 11, page 27).

86. The ratio of endoscopy recovery bays to rooms varied among units. Some hospitals had six endoscopy recovery bays available for each procedure room within the unit, whereas others had one. If there are too few recovery bays, the endoscopy room and staff might not be used to their full potential. We did not find a statistically significant relationship between the ratio of bays to rooms and the number of procedures per room. However, we found that, on average, each extra hour spent scoping per week increased the number of weighted procedures carried out per room by 115 over the year. There were, however, differences in the total number of procedures carried out per room among hospitals with similar scoping hours.

52 British Society of Gastroenterology weighting system.

53 Wishaw General Hospital and Roodlands Hospital have been excluded here as staffing information was not reliable.

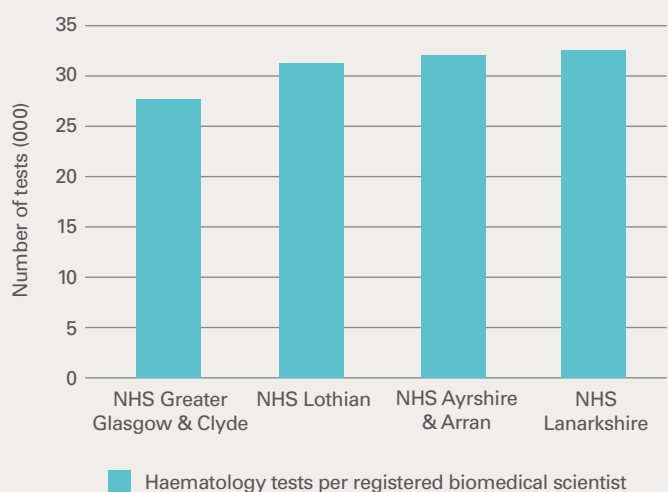
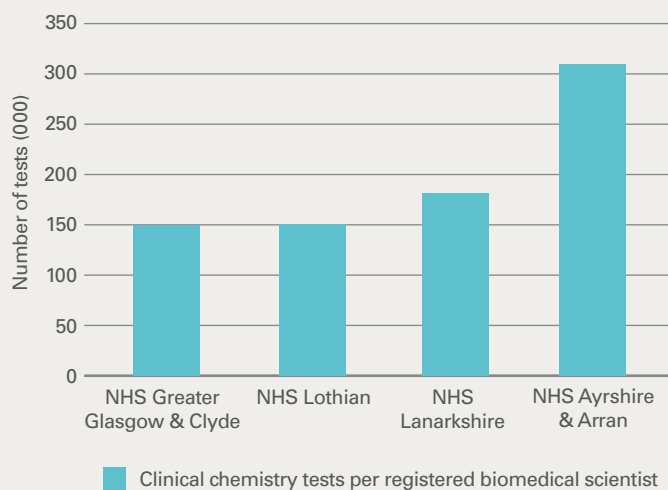
54 Balfour Hospital has also been excluded as explained in Case study 5.

55 Using ISD Cost Book coding the Royal Infirmary of Edinburgh and Gartnavel General Hospital are both classed as large teaching hospitals.

Exhibit 10

Workload in relation to the number of whole time equivalent registered biomedical scientists in two laboratory disciplines, 2006/07

NHS boards varied in terms of ratio of laboratory activity to number of whole time equivalent biomedical scientists.



Source: Audit Scotland fieldwork based on Keele Benchmarking Scheme data

There is variation in the use of radiology equipment across NHS boards

87. The number of examinations per CT scanner, known as throughput of equipment, varied across NHS boards. The average throughput per CT scanner was 8,551. Performance ranged from 4,944 examinations per CT scanner in Clyde hospitals to 11,099 in NHS Lanarkshire. MRI throughput also varied from 3,471 at NHS Ayrshire and Arran to 5,466

at Clyde hospitals; the average across the sample boards was 3,952 (Exhibit 12). We found no statistically significant relationship between age of the equipment and the equipment throughput. Inconsistencies in how NHS boards count examinations might explain some but not all of the variation. NHS boards should ensure that equipment is used to its full potential.

Ten per cent of planned endoscopy sessions were not used across sample hospitals

88. Over a third of the endoscopy units we reviewed could not provide the number of planned endoscopy sessions that they actually used in 2006/07. From those that could provide data, around ten per cent of endoscopy sessions (902 sessions) were unused. The majority of sessions were cancelled by hospitals due to staff not being available. Across our sample hospitals, an average of seven weighted endoscopy procedures were performed per session.⁵⁶ If the 902 unused sessions had been used, hospitals could have undertaken 6,314 more weighted procedures.

The amount of laboratory repeat testing could be reduced

89. As part of this audit, hospitals collected information on the number of thyroid function tests that were repeated on the same patient within four days and the number of Vitamin B tests repeated on the same patient within seven days. Although repeat testing is sometimes clinically necessary, there is rarely a clinical reason for having to repeat these tests within these timescales.

90. The incidence of repeat thyroid function testing ranged from 0.6 per cent at the Western Infirmary to 19.4 per cent in Ayrshire and Arran hospitals.⁵⁷ The variation in Vitamin B testing ranged from 2.1 per cent in Hairmyres Hospital to 5.9 per cent in the Ayrshire and Arran hospitals (Exhibit 13, page 28).

91. NHS boards advised that levels of repeat testing are high in some areas because they do not have an electronic system to inform clinicians and laboratory staff which tests have already been requested, resulting in the same tests sometimes being re-ordered for the patient. NHS Orkney

⁵⁶ Audit Scotland fieldwork, 2008.

⁵⁷ NHS Ayrshire and Arran reported this information for Crosshouse and Ayr hospitals combined.

Exhibit 11

Facilities and weighted endoscopy procedures across the sample hospitals

Hospital	Number of rooms within endoscopy unit	Number of recovery bays	Ratio bays to room	Total number of weighted endoscopy procedures	Weighted procedures per room	Weighted procedures per recovery bay	Endoscopy procedures per WTE endoscopy staff	Scoping hours
Gartnavel General Hospital	3	13	4	7,330	2,443	564	422	35
Glasgow Royal Infirmary	3	12	4	6,267	2,089	522	236	37.5
Royal Infirmary of Edinburgh	3	3	1	5,888	1,963	1,963	191	40
Western General Hospital	3	INA	INA	9,158	3,053	INA	286	40
Ayr Hospital	2	11	6	6,222	3,111	566	364	32.5
Crosshouse Hospital	4	10	3	10,494	2,624	1,049	323	32.5
Hairmyres Hospital	2	5	3	4,702	2,351	940	446	37.5
Inverclyde Royal Hospital	1	5	5	2,900	2,900	580	408	31.5
Monklands Hospital	2	12	6	4,456	2,228	371	231	37.5
Royal Alexandra Hospital	2	4	2	6,442	3,221	1,611	393	35
Southern General Hospital	2	11	6	4,511	2,256	410	187	35
St John's Hospital	1	4	4	4,488	4,488	1,122	325	39.5
Stobhill Hospital	2	12	6	6,047	3,024	504	313	35
Victoria Infirmary	2	8	4	5,310	2,655	664	239	31.5
Wishaw General Hospital	2	12	6	7,833	3,917	653	INA	37.5
Vale of Leven Hospital	1	1	1	2,355	2,355	2,355	176	29.5
Roodlands Hospital	NA	NA	NA	NA	NA	NA	INA	24.5
Leith Community Treatment Centre	1	2	2	1,864	1,864	932	379	28.5

Notes:

1. INA – information was not available.
 2. NA – not applicable.
 3. Roodlands Hospital does not have a dedicated endoscopy unit.
- Source: Audit Scotland fieldwork, 2008

Exhibit 12

Use of radiology equipment, 2006/07

Throughput per CT and MRI scanner varies across sample NHS boards.

	CT			MRI		
	Number of examinations	CT scanners	Throughput of equipment	Number of examinations	MRI scanners	Throughput of equipment
NHS Ayrshire & Arran	18,733	2	9,367	6,942	2	3,471
Pan Glasgow	80,466	8	10,058	23,501	7	3,357
Pan Clyde	14,833	3	4,944	5,466	1	5,466
NHS Lanarkshire	33,297	3	11,099	7,941	2	3,971
NHS Lothian	43,729	6	7,288	17,483	5	3,497

Note: NHS Greater Glasgow and Clyde provided data on hospitals in Glasgow and Clyde separately. These are presented as Pan Glasgow and Pan Clyde.
Source: NHSScotland Radiology Benchmarking Project and Audit Scotland fieldwork

has an electronic system that flags to staff requesting tests that the laboratory has already processed the same test for the same patient. The clinician then needs to decide if they wish to repeat the test, providing a reason if it is within certain timescales. This reduces the number of repeat tests that are not clinically necessary.

92. NHS boards should investigate the cost-effectiveness of introducing systems into hospitals that avoid staff ordering unnecessary repeat tests. Guidelines should also be produced by laboratory departments for clinical staff outlining the length of time that test results remain valid.

Exhibit 13

Repeat clinical chemistry and haematology tests

The incidence of repeat laboratory testing varies across hospitals.

		Percentage of thyroid function tests repeated on the same patient within 4 days		Percentage of vitamin B tests repeated on the same patient within 7 days	
		Inpatient, A&E and GP-referred tests (%)	Inpatient and A&E tests (%)	Inpatient, A&E and GP-referred tests (%)	Inpatient and A&E tests (%)
NHS board	NHS Greater Glasgow & Clyde	2.6	2.5	3.2	3.0
	NHS Lothian	3.1	6.3	3.4	9.0
	NHS Ayrshire & Arran	5.6	19.4	5.9	14.1
Hospital	Gartnavel General Hospital	3.4	2.5	INA	INA
	Western Infirmary	1.0	0.6	3.6	2.4
	Glasgow Royal Infirmary	4.4	3.9	3.8	3.0
	Victoria Infirmary	1.9	1.9	N/A	N/A
	Southern General Hospital	3.7	2.3	3.3	2.8
	Royal Hospital for Sick Children, Yorkhill	1.9	1.9	2.6	2.6
	Stobhill Hospital	4.4	4.9	3.2	3.0
	Inverclyde Royal Hospital	INA	INA	INA	INA
	Vale of Leven Hospital	INA	INA	INA	INA
	Monklands Hospital	4.1	6.8	5.1	9.5
	Royal Alexandra Hospital	0.4	1.6	2.7	4.6
	Hairmyres Hospital	5.2	10.8	2.1	4.0
	Wishaw General Hospital	3.4	4.9	2.9	4.7
	Balfour Hospital	0.0	0.0	0.0	0.0

Notes:

1. Data are based on four-week snapshot audit, March 2008.
2. NHS Greater Glasgow and Clyde provided data by hospital as well as aggregated for the board.
3. NHS Lothian and NHS Ayrshire and Arran provided board level data.
4. NHS Lanarkshire could not extract data on GP-referred tests for the snapshot audit period but gave data on outpatients instead.
5. INA – information was not available.
6. N/A – not applicable.

Source: Audit Scotland fieldwork, 2008

Recommendations

NHS boards should:

- work with ISD Scotland to standardise the way diagnostic activity is counted and ensure data are recorded consistently
- improve collection and reporting of local information on the performance of diagnostic services
- ensure that the data they report to the Cost Book reflects the data they report to the Keele Benchmarking Scheme and NHSScotland Radiology Benchmarking Project
- review performance of their diagnostic services against indicators of efficiency and make use of benchmarking data to identify potential improvements on an ongoing basis
- develop guidelines for clinicians and GPs to help reduce repeat testing.

ISD Scotland should work with the Scottish Government and NHS boards to:

- improve the quality and consistency of national data sets that include diagnostic services, particularly the Cost Book.

The Scottish Government should:

- work with NHS boards and ISD Scotland to improve data collection systems for all diagnostic services as a matter of priority
- work with NHS boards to develop an up-to-date system to weight radiology and endoscopy activity reflecting complexity and case-mix

- ensure that robust benchmarking data, including quality indicators, are available to NHS boards to allow them to compare efficiency, including cost of endoscopy services.

Appendix 1.

Advisory group members

Member	Organisation
Derek Bishop	Scottish Pathology Network Manager
Susan Goldsmith	Director of Finance, NHS Lanarkshire
Colin Lauder	Programme Director (Diagnostics) Health Delivery Directorate/Access Support Division, Scottish Government
Winnie Miller	Planning Manager Diagnostics, NHS Greater Glasgow and Clyde
Ian Penman	Diagnostics Collaborative Programme Clinical Lead for Endoscopy Services, NHS Lothian
Jonathon Procter	NHS Board Executive Lead for Diagnostic Collaborative Programme, NHS Forth Valley
Margaret Sherwood	Data Development Manager (Diagnostics), Waiting Times Programme, ISD Scotland
Jan Warner	Director of Patient Safety and Performance Assessment, NHS QIS

Note: Members of the project advisory group sat in a personal capacity only. The content and conclusions of this report are the sole responsibility of Audit Scotland.

Appendix 2.

Services that were part of Audit Scotland's fieldwork

Radiology services that were part of Audit Scotland's fieldwork

	CT services	MRI services	Ultrasound services	Barium studies
NHS Ayrshire & Arran				
Ayr Hospital	✓	✓	✓	✓
Crosshouse Hospital	✓	✓	✓	✓
NHS Greater Glasgow & Clyde				
Glasgow Royal Infirmary	✓	✓	✓	✓
Stobhill Hospital	✓	x	✓	✓
Western Infirmary	✓	✓	✓	✓
Southern General Hospital	✓	✓	✓	✓
Victoria Infirmary	✓	x	✓	✓
Royal Hospital for Sick Children, Yorkhill	✓	✓	✓	✓
Gartnavel General Hospital	✓	✓	✓	✓
Inverclyde Royal Hospital	✓	x	✓	✓
Royal Alexandra Hospital	✓	✓	✓	✓
Vale of Leven Hospital	✓	x	✓	✓
Institute of Neurological Sciences, Southern General Hospital	✓	✓	x	x
NHS Lanarkshire				
Monklands Hospital	✓	x	✓	✓
Hairmyres Hospital	✓	✓	✓	✓
Wishaw General Hospital	✓	✓	✓	✓
NHS Lothian				
Western General (Dept of Clinical Neurosciences)	✓	✓	✓	x
Western General (Main Dept)	✓	✓	✓	✓
St John's Hospital	✓	x	✓	✓
Royal Infirmary of Edinburgh	✓	✓	✓	✓
Royal Hospital for Sick Children	✓	✓	✓	✓
NHS Orkney				
Balfour Hospital	x	x	✓	✓

Note: NHS Lothian provided data for primary care sites in its submission to the NHSScotland Radiology Benchmarking Project. It did not provide data for these sites as part of Audit Scotland's fieldwork.

Endoscopy and cystoscopy services that were part of Audit Scotland's fieldwork.

	Endoscopy	Cystoscopy
NHS Ayrshire & Arran		
Ayr Hospital	✓	✓
Crosshouse Hospital	✓	x
NHS Greater Glasgow & Clyde		
Gartnavel General Hospital	✓	✓
Glasgow Royal Infirmary	✓	✓
Southern General Hospital	✓	✓
Stobhill Hospital	✓	✓
Victoria Infirmary	✓	x
Inverclyde Royal Hospital	✓	✓
Royal Alexandra Hospital	✓	✓
Vale of Leven Hospital	✓	✓
NHS Lanarkshire		
Monklands Hospital	✓	✓
Hairmyres Hospital	✓	✓
Wishaw General Hospital	✓	✓
NHS Lothian		
Royal Infirmary of Edinburgh	✓	x
Western General Hospital	✓	x
St John's Hospital	✓	✓
Leith Community Treatment Centre	✓	x
Roodlands Hospital	✓	x
NHS Orkney		
Balfour Hospital	✓	✓

Notes:

1. Leith Community Treatment Centre and Roodlands Hospital do not carry out colonoscopy procedures.
2. The majority of cystoscopy procedures are performed in either the day surgery unit or the main theatre.

Laboratories and disciplines across sample hospitals that were part of Audit Scotland's fieldwork.

	Microbiology	Clinical chemistry	Haematology	Histopathology
NHS Ayrshire & Arran				
Pan Ayrshire & Arran Service based in Ayr Hospital and Crosshouse Hospital	✓	✓	✓	✓
NHS Greater Glasgow & Clyde				
Gartnavel General Hospital	x	✓	✓	x
Stobhill Hospital	x	✓	✓	x
Western Infirmary	✓	✓	✓	✓
Southern General Hospital	✓	✓	✓	✓
Royal Hospital for Sick Children, Yorkhill	✓	✓	✓	✓
Inverclyde Royal Hospital	✓	✓	✓	✓
Royal Alexandra Hospital	✓	✓	✓	✓
Vale of Leven Hospital	✓	✓	✓	x
Glasgow Royal Infirmary	✓	✓	✓	✓
Victoria Infirmary	✓	✓	✓	x
NHS Lanarkshire				
Monklands Hospital	✓	✓	✓	✓
Hairmyres Hospital	✓	✓	✓	x
Wishaw General Hospital	✓	✓	✓	✓
NHS Lothian				
Western General Hospital	x	✓	✓	x
St John's Hospital	✓	✓	✓	x
Royal Infirmary of Edinburgh	✓	✓	✓	✓
Royal Hospital for Sick Children	x	✓	✓	x
NHS Orkney				
Balfour Hospital	✓	✓	✓	x

Appendix 3.

List of efficiency indicators used as part of Audit Scotland's fieldwork

Radiology	
<p>We used the Körner weighting system that reflects the relative effort of radiology examinations: the system allows for differences in case-mix by broadly weighting the examinations according to the amount of resources hospitals need to carry them out. The Körner system was developed in the mid 1990s and this needs to be updated to reflect advances in technology. However, there is no other agreed up-to-date weighting system. We used the system to weight the following radiology activity carried out by the sample NHS boards.</p>	
Activity	Körner weight
Ultrasound (non-obstetric)	2.5
CT	6
MRI	60
Barium enemas	6
Indicator	Explanation
Weighted examinations per whole time equivalent qualified radiologist	Annual radiology examinations, weighted using Körner system to reflect relative effort of examinations/total WTE qualified radiologists
Weighted number of radiology patient attendances per whole time equivalent qualified radiologist	Annual weighted number of radiology patient attendances, weighted using Körner system/total WTE qualified radiologists
Weighted examinations per whole time equivalent qualified radiographer	Annual radiology examinations, weighted using Körner system to reflect relative effort of examinations/total WTE qualified radiographers
Weighted number of radiology patient attendances per whole time equivalent qualified radiographer	Annual weighted number of radiology patient attendances, weighted using Körner system/total WTE qualified radiographers
Annual throughput per item of equipment	Annual CT examinations/total number CT scanners in use Annual MRI examinations/total number MRI machines in use

Endoscopy	We used the British Society of Gastroenterology weighting system to take account of case-mix in diagnostic endoscopy workload. For example, a lower gastrointestinal procedure typically takes 20 minutes whereas a colonoscopy typically takes 40 minutes.	
	We used the system to weight the following endoscopy activity carried out by the sample NHS boards.	
	Activity	Weight
	Upper gastrointestinal procedure	1
	Sigmoidoscopy/lower gastrointestinal procedure	1
	Cystoscopy	1.5
	Colonoscopy	2
	Indicator	Explanation
	Weighted endoscopy procedures per whole time equivalent unit staff	Annual endoscopy procedures, weighted for complexity using the BSG system/total WTE number of endoscopy staff* *WTE was calculated on staff contribution to the service
	Weighted cystoscopy procedures per total whole time equivalent cystoscopy staff	Annual cystoscopy procedures, weighted by BSG system to reflect relative effort/total WTE number of cystoscopy staff
	Weighted throughput per endoscopy room	Annual endoscopy procedures, weighted by BSG system/number of rooms in endoscopy unit
	Proportion of planned endoscopy sessions used	Number of planned sessions that were used/number of sessions that were planned
Laboratory	Tests per WTE registered biomedical scientist	Annual clinical chemistry tests/total WTE registered biomedical scientists Annual haematology tests/total WTE registered biomedical scientists
	Cost per test or request	Total cost/total number of tests or requests
	Percentage of thyroid function tests repeated for the same patient, within four days, over a month	Number of repeated tests for the same patient within four days/total number of tests carried out in a month
	Percentage of vitamin B tests repeated for the same patient, within seven days, over a month	Number of repeated tests for the same patient within seven days/total number of tests carried out in a month

Appendix 4.

Glossary of terms

Barium enema	A barium enema is a special X-ray test used to examine the large bowel (colon and rectum). The procedure is usually performed in the imaging or radiology department. Liquid called barium, which shows up on X-rays, is run into the colon using a tube. X-ray images of the bowel appear on screen making it possible for radiologists to examine it.
Biomedical scientists	Biomedical scientists carry out laboratory tests on human samples to help clinicians diagnose illnesses and evaluate the effectiveness of treatment. Biomedical scientists often specialise in one aspect of laboratory medicine, for example, clinical chemistry.
Clinical chemistry	Clinical chemistry looks at hormones and other chemicals in a patient's blood or fluids for any chemical abnormalities.
Colonoscopy	An endoscopic examination of the entire colon to look for abnormal growths or early signs of cancer and to evaluate symptoms such as abdominal pain, rectal bleeding and weight loss. Patients are sedated or given painkillers to help them relax when undergoing a colonoscopy. The doctor or nurse endoscopist uses a colonoscope (a long, flexible, lighted tube). This has a small video camera that transmits an image of the inside of the colon onto a screen. This allows the doctor or nurse to look closely at the area and, if necessary, remove tissue samples using tiny tools. The sample is then sent to the laboratory for testing.
Computed Tomography (CT)	A CT scan is a specialised X-ray test that can give clear pictures of the inside of the body. It can give good pictures of soft tissues of the body which do not show on ordinary X-ray pictures. A computer then processes the results and displays the scan on a monitor as a two or three-dimensional image.
Cystoscopy	A procedure to look inside the urinary bladder. The doctor uses either a flexible or rigid cystoscope to examine inside the bladder and urethra. Patients are given local or general anaesthesia when undergoing a cystoscopy.
Cytology	This laboratory discipline studies cells, usually to determine whether or not there is any cancerous growth or infection. Cytology is known for its role within cervical screening programmes.
Diagnostic procedure	An examination used to diagnose a clinical problem.
Full blood count (FBC)	This is a common haematology test and is normally carried out using an automated machine. The test gives information about cells in a patient's blood. A full blood count normally looks at the number of red blood cells, white cells, platelets and haemoglobin.
Global Rating Scale	A self-assessment tool developed to improve the quality of patient care provided by endoscopy units. The tool assesses performance against two aspects of patient care: patient experience and clinical quality. These aspects cover 12 elements including patient aftercare and communication with patients.

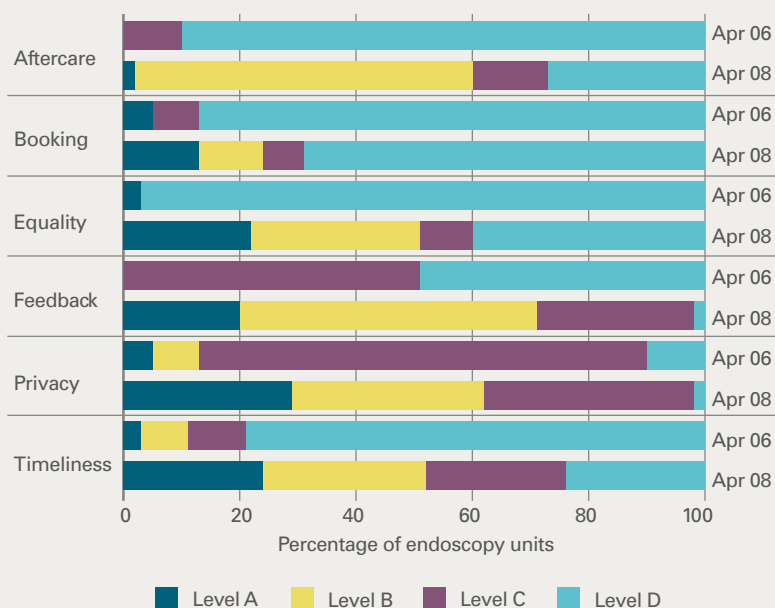
Haematology	This laboratory discipline studies blood, blood-forming organs and blood diseases.
Histopathology	This laboratory discipline processes tissue samples and fluids to check for any abnormalities. For example, doctors remove tissue during a procedure to check it for infection or tumours.
Magnetic Resonance Imaging (MRI)	An MRI scan is a test that uses magnetic and radio waves to give detailed pictures of organs and other structures inside the body. The scanner picks up these signals and a computer turns them into an image. An MRI scan is also able to provide clear pictures of parts of the body that are surrounded by bone tissue, so is useful when examining the brain and spinal cord.
Microbiology	This laboratory discipline studies micro-organisms, including bacteria and fungi, and sometimes viruses.
Nurse endoscopist	A nurse who is trained to undertake endoscopy procedures.
Radiographer	Non-medically qualified person who assists the radiologist by taking the image. This role is being extended to include the reporting of certain types of examinations, for example, ultrasounds.
Radiologist	Medically qualified doctor who specialises in the use of imaging techniques such as CT scans. Radiologists usually interpret and report the majority of radiology examinations.
Sigmoidoscopy (flexi) often referred to as lower GI procedure	Examination of the lining of the large intestine, from the rectum through the last part of the colon (the sigmoid or descending colon). The doctor or nurse endoscopist uses a sigmoidoscope (a lighted tube) to look for bleeding or non-cancerous growths called polyps. The procedure is also used as a screening test for colorectal cancer. In most cases, sedatives and/or anaesthesia are not necessary.
Thyroid function tests	A type of clinical chemistry test that assesses blood for thyroid disorders.
Ultrasound procedure (non-obstetric)	An ultrasound scan is a common test that uses sound waves to create images of organs and structures inside the body.
Obstetric ultrasound	An obstetric ultrasound is a scan of the pelvis which produces an image of the foetus in the uterus.
Upper GI endoscopy	This endoscopic test enables the doctor to look at the lining of the oesophagus, the stomach and the duodenum. An endoscope (a long, flexible, lighted tube) is passed through the patient's mouth into the stomach, which gives the doctor or nurse a clear view of the lining of the stomach to check for abnormalities. If necessary, the doctor or nurse may remove a tissue sample using tiny forceps. The sample is then sent to the laboratory for analysis.

Appendix 5.

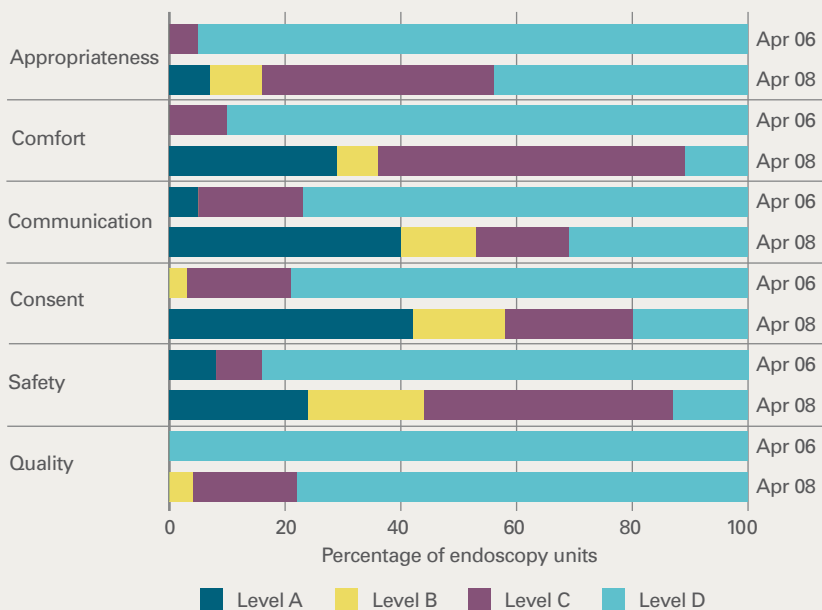
Global Rating Scale results

Scotland GRS quality of patient experience and clinical quality, April 2006 and April 2008
All elements have been improving over the last two years.

Patient experience



Clinical quality



Notes:

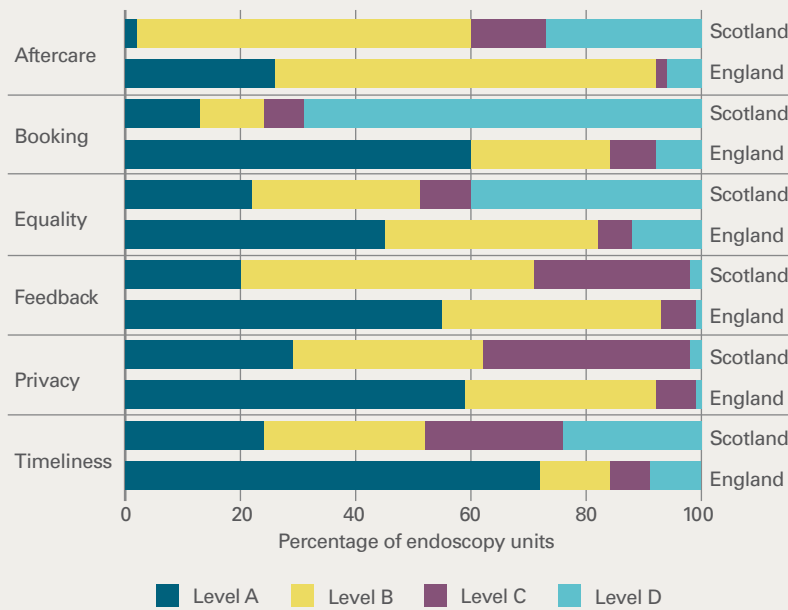
- Each element is measured on a scale from A to D, where A is an excellent service and D is basic.
- More units participated in GRS in April 2008 than in April 2006.

Source: GRS Scotland

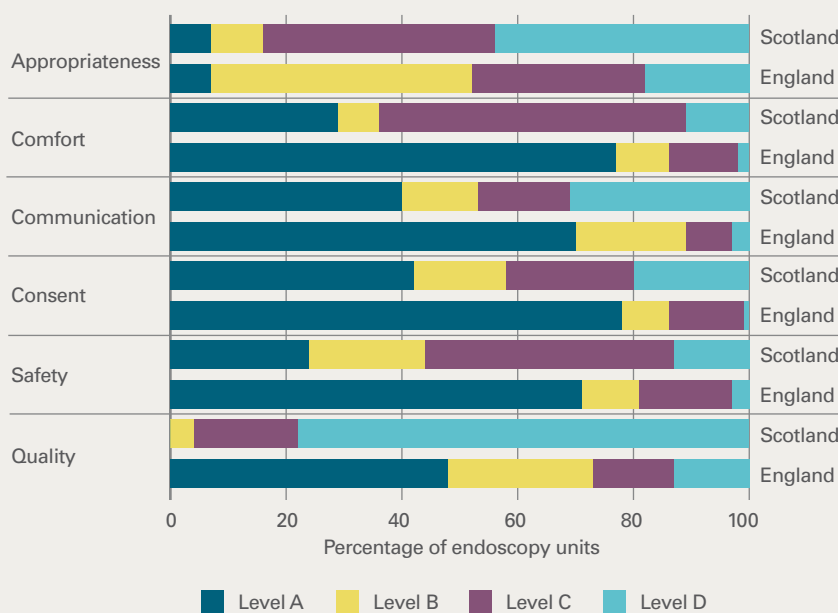
Scotland and England GRS results for patient experience and clinical quality, April 2008

England's endoscopy units are performing better than Scotland's on all elements of patient experience and clinical quality.

Patient experience



Clinical quality



Note: Each element is measured on a scale from A to D, where A is an excellent service and D is basic.

Source: GRS Scotland and England

Appendix 6.

Self-assessment checklist for NHS boards

The checklist on the next few pages sets out some high-level statements about diagnostic services based on issues raised in this report. NHS boards should assess themselves against each of the statements and consider which statement most accurately reflects their current situation:

- Not in place and action needed.
- Not in place but action in hand.
- In place but needs improving.
- In place and working well.

This approach will enable boards to identify what action needs to be taken.

Self-assessment of diagnostic services

The last column in the checklist can be used to record sources of evidence, supplementary comments to support your assessment or to highlight areas of interest, etc.

Issue	Assessment of current position					Comment to support or explain your statement
	No – action needed	No – but action in hand	Yes – in place but needs improving	Yes – in place and working well	Not applicable	
Do you benchmark with endoscopy units across the UK which are returning better GRS scores to identify good practice that can be applied locally?						
Do you offer patients a choice of date and time for all diagnostic appointments?						
Do you have local targets for test turnaround times that reflect their clinical urgency?						
Do you monitor performance against these targets?						
Do you pool waiting lists for diagnostic radiology and endoscopy tests across consultants?						
Do you have diagnostic test protocols and referral guidelines in place for GPs and clinicians?						
Are GPs and clinicians using these?						
Do endoscopy and radiology departments have processes in place to check referrals for diagnostic tests to ensure they are appropriate?						
Do you collect and monitor information on the source and level of demand for diagnostic tests, and feed referral rates back to GPs and clinicians?						

Issue	Assessment of current position					Comment to support or explain your statement
	No – action needed	No – but action in hand	Yes – in place but needs improving	Yes – in place and working well	Not applicable	
Have you explored the possibility of extending the range of diagnostic tests that GPs can refer patients for directly through clear protocols?						
Are diagnostic services included in the board's planning for achieving and maintaining the new 18-week referral to treatment target?						
Do you collect and monitor local information on the performance of diagnostic services? For example: <ul style="list-style-type: none"> • number of planned sessions that were used • test turnaround times. 						
Do data reported to the Cost Book reflect data that are reported to the Keele Benchmarking Scheme and the NHSScotland Radiology Benchmarking Project?						
Do you review performance of diagnostic services against indicators of efficiency and make use of benchmarking data to identify potential improvements on an ongoing basis?						
Are there guidelines in place for clinicians and GPs to help reduce repeat testing?						

Review of NHS diagnostic services

If you require this publication in an alternative format and/or language, please contact us to discuss your needs.

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