Implementing 7 Day working in Imaging Departments: Good Practice Guidance

A Report from the National Imaging Clinical Advisory Group

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Foreword

The weekend as protected time has been accepted in anglophile western countries since the 1940s. In the UK challenges from the large retailers resulted in a change to the law in 1994. Since then social behaviour has changed profoundly and public expectation that services should be designed for customer convenience has grown. As a result the weekend provision of routine services in many other industries is now common - but not in healthcare where it offers the opportunity to improve clinical outcomes and reduce cost, with the added benefit of offering a much more patient focussed service.

Diagnostic services, including imaging, are central to all secondary care and a significant proportion of primary care, yet expensive plant lies underutilised on Saturdays and Sundays while patients wait, creating inconvenience and unnecessary anxiety. Inefficient weekend diagnostic services also complicate the lives of general practitioners who are seeking answers for their patients and the lives of hospital staff who have to explain that nothing can happen for a couple of days, while patients wait on the wards for the weekend to pass before decisions are made.

If we genuinely want to offer a patient focussed and efficient service based on clinical outcomes, the way we deliver services must change with the times to meet our patients' hopes and expectations. Furthermore, the economic environment should catalyse this process.

This guidance explores the issues involved and provides a framework to help the NHS provide a seven day service for our patients.

I am delighted that the publication of this report coincides with the first meeting of expert stakeholders, who will consider how routine seven day working in specific clinical services could be introduced successfully across the NHS.

Sir Bruce Keogh
NHS Medical Director

'The Department of Health is committed to ensuring the NHS provides a comprehensive service to all, whatever their gender, race, disability, age, sexual orientation, religion or belief.'

Executive Summary

This document has been prepared by a specially convened sub-group of the National Imaging Clinical Advisory Group (NICAG) to provide advice for commissioners and providers who wish to develop 7 day working in imaging departments. It was commissioned as a result of the growing enthusiasm for 7 day working in healthcare services, both to utilise the resources of the NHS and to offer patients a more customer-focussed service.

In recent years, spending on the NHS in England has increased rapidly and is now £105 billion per year. This investment has helped to modernise the healthcare service, increase capacity, staffing and given patients access to new, more effective drugs and treatments and the benefits from higher quality care. The NHS needs to make up to £20 billion of recurrent efficiency savings by 2014/15 to meet additional demands on services from an ageing population and to be able to continue to invest in new technologies and new drugs.

Many of the measures outlined in this document, are designed to support the NHS to meet the Quality, Innovation, Productivity and Prevention (QIPP) challenge, by demonstrating how they can improve quality, whilst simultaneously reducing cost, either by identifying where resources might be released or by improving understanding of the key interventions that have greatest effect.

An essential contribution to this process will be a review of how we work to move to 7 day working. QIPP is key to reducing costs, whilst ensuring the highest standards of care and extended working is an essential component of this. To realise the benefits of 7 day working, organisations will need to invest to save. In a society where other services are available every day it is increasingly incongruous that only emergency healthcare is available at weekends.

This is an opportunity to build on the growing enthusiasm for the general concept of 7 day working in healthcare from medical leaders and to encourage those designing the commissioning framework to ensure incentives and levers that enable 7 day working are considered.

This guide concentrates and describes the evidence for extending the 5 day week to 7 days in imaging services, reviewing the significant emerging drivers for change in service delivery. Nuclear Medicine and Positron Emission Tomography and Computerised Tomography (PET CT) services have been excluded from this guide because there are issues of complexity around shortages of radioisotope, shortfalls of wide ranging technical staff and both are traditional 5 day services.

Both commissioners and providers of imaging services will find the evidence for change and guidance for service delivery helpful. The guidance is divided into sections addressing the key

areas of: the reasons and evidence for change to 7 day working, the managerial considerations, informatics issues and workforce implications.

By necessity the focus on imaging precludes discussion of the wider healthcare delivery issues of 7 day working for the whole NHS. 7 day working will impact on nearly all services involved in healthcare provision. The issues involved are being carefully looked at by the NHS, the Department of Health and the general healthcare community. This paper is intended to feed into that wider work and debate of '7 Day Working in Hospitals' currently being taken forward by the Department, led by Sir Bruce Keogh, which includes work around financial modelling. Imaging services should not be looked at in isolation but as part of the whole system of healthcare provision and it is in this context that services should explore extended day working.

It will be easier to ensure staff engagement in diagnostic services such as imaging, if other staff are working in a similar manner and available to respond to diagnostic information across weekends and in the evenings. This document also includes case studies and excellent examples of imaging services which have already changed to the benefit of patients and are showing significant improved quality and reduced cost as a result.

There are many co-dependencies in considering an imaging service change as significant as this. The information technology required to underpin extended routine working across weekends and evenings is highlighted here and should not be underestimated. However, there are significant cost savings in high value equipment overall if it is utilised for a greater percentage of working time. This guidance includes an overview as to how this can be achieved and the issues that should be considered.

One of the most important things to achieve will be a shift in the attitude of healthcare staff. This might be achieved in a number of ways. We need to ensure staff are fully engaged and understand the reasons for the proposals. Some of the significant contractual issues are discussed, as well as the leadership challenges, which will need to be overcome in order to deliver these changes.

Most importantly the public are increasingly aware of the benefits of high quality evidence based healthcare and are expressing a stronger desire for healthcare services to be built more around their needs as patients and customers of healthcare services. This guidance begins to explore many of the issues for implementing 7 day working in diagnostic imaging and as services evolve and develop, more information will rapidly become available, providing more evidence of the benefits of these changes.

Background & Introduction

1. This guide has been prepared at a time when the NHS is providing mainly emergency services (including accident & emergency, maternity and acute services) at the weekend, but for most staff the working week is limited to daytime from Monday to Friday with the exception of variable on call commitments at night and over the weekend. In other industries, (manufacturing, retail, recreation and travel) societal and economic pressures have demanded a progressive move to 7 day working.
2. The weekend as protected time has its roots in respecting religious practices and has been universally accepted in anglophile western countries since the 1940s. Challenges from large retailers resulted in the Sunday Trading Act 1994. Since then, social behaviour has changed profoundly and expectations of a culture of service provision for customer convenience has developed which has yet to spread into healthcare.
3. There has been a steady increase in out of hours work over the past twenty years, and more dramatically over the past five years. The reasons for this are many and complex. For example, an increased and entirely appropriate reliance on pre-operative tests has increased the use of diagnostic services at night time and weekend so that optimal patient care can be planned.
4. This guide looks at imaging services in England and describes some of the changes and difficulties encountered when planning to extend services. It builds on imaging work already produced in the particular areas of interventional radiology, paediatric imaging and the imaging requirements necessary to deliver the stroke strategy.
5. The Healthcare Commission report *An Improving Picture? Imaging Services in Acute and Specialist Trusts* published in 2007 reviewed imaging services in NHS Trusts [1]. When it looked at availability of services, it found that whilst imaging departments have to provide round-the-clock service for emergency patients, for non-urgent examinations they were typically open for only 40 hours a week. This was mainly because of the high marginal cost of providing staff to cover the department for longer hours than this. However, 40 hours was not always judged sufficient to cope with demand.
6. The report also found that expensive equipment was idle for much of the week. Only 23% of departments provided routine Magnetic Resonance Imaging (MRI) services for more than 60 hours each week – fewer than were reported in the 2001 review. This may be because fewer machines were available in 2001. In contrast, standard operational hours for Computed Tomography (CT) services had increased, with 14% of departments operating for 60 or more hours a week. Open access or General Practitioner (GP)-referred plain x-ray imaging was provided for 60 or more hours a week by 14% of departments with 30 departments open on Saturdays and 8 on Sundays.
7. A recent report from the Taxpayers Alliance, *NHS Machines Utilisation of High-Value Equipment at NHS Trusts* (2009) looked at the usage of key pieces of expensive diagnostic equipment including CT and MRI and found that:

> 'many NHS Trusts are not adequately utilising expensive diagnostic…..equipment. If NHS Trusts are to establish genuine efficiency, the management of machines must be improved.'

8. The data collected for this report found that there was considerable room for improvement. The report highlighted both under utilisation of available capacity and a considerable variation in utilisation rates [2, 3].

9. Following on from the National Audit Office (NAO) report *'Delivering the Cancer Reform Strategy'* (2010), which identified variation in use of radiotherapy equipment, the NAO undertook a value for money study to address cost effective delivery in *Managing High Value Capital Equipment in the NHS in England* (2011). The NHS has spent over £1 billion on new equipment over the last three years, much of which has been spent on high value technological equipment. The underused capacity is thought to contribute to England's relatively poor performance amongst Organisation for Economic Co-operation and Development (OECD) countries for patient access to advanced imaging technologies [4].

10. The number of CT and MRI scans carried out for the NHS has increased threefold in the last ten years [5]. The 2011 NAO report found a wide variation in the opening times of CT and MRI Imaging Departments. The average opening time was 60 hours with some NHS Trusts offering a 7 day week imaging service with extended hours. One NHS Trust opened for over 100 hours a week but 10% of NHS Trusts were only open for 40 hours per week. Inevitably, this led to variations in the number of scans per CT scanner per annum from 4,531 to 21,924 (2009-10).

11. The NHS Atlas of Variation details the geographical variation in CT and MRI use across England (Appendix C) [6]. A move to 7 day working is likely to contribute to reducing geographical variation in imaging service provision.

12. A 2010 report on major trauma found that the median time taken for a CT scan for a serious brain injury was approximately 1.5 hours, and that 25% of patients with a head injury had to wait over 2 hours [7]. Also, NICE guidelines state that the time taken to have a CT scan following a suspected serious head injury should be less than one hour after arrival at the emergency department [8]. Better use of equipment is also important to deliver safer care for patients. In order to deliver safe care and be able to respond to immediate requests for urgent examinations it is essential that equipment is not booked at 100% capacity.

13. In the UK in 2008–09 there were approximately 64 million out-patient attendances, the majority of which were in acute specialties and more than 9 million in-patient hospital spells for acute specialties. Approximately 206,900 beds were available in NHS hospitals in the UK, a rate of 3.4 per 1,000 population. Of these, 2.1 beds per 1,000 population were

available for acute specialties. This means that England had on average 2.0 daily available beds per 1,000 population. The number of hospital spells per available bed varied between UK countries, as did the average length of stay, but in England there were 71.7 spells per year per available bed with an average length of stay of 4.3 days. The number of beds available in the acute sector was at least twice as great as in any other sector. There were also more than 5.1 million day cases for acute specialties in England in 2008/09. According to Department of Health form KH12 for Imaging and radiodiagnostic examinations and tests, in the same year, 35,943,761 imaging examinations were undertaken in England [5,6].

14. There is evidence that using imaging appropriately can reduce length of stay. In 2005 a study by Beinfeld and Gazelle observed that hospital costs had stabilised, despite marked increases in imaging costs and postulated that this could be attributed to a decrease in other factors such as length of stay because of the increased use of modern imaging techniques [9].

15. In 2010, Batlle et al concluded that although there were several limitations to their study 'early advanced imaging with CT, MRI, or nuclear scintigraphy, particularly on the day before or the day of admission, is associated with significantly shorter length of stay compared with patients imaged later in their hospital course' and that 'specific examination types associated with shorter length of stay were CT and MRI, particularly abdominal CT and neurologic CT and MRI.' [10]

16. The evidence in favour of 7 day working for imaging departments is strong.

What Do We Mean By 7 Day Working?

17. Historically, 7 day working has been viewed solely as an acute care issue even though it is known to bring significant benefits to elective care. Ideally we should seek to provide patient centred, convenient services routinely at weekends, involving the entire team in service delivery. There is a strong argument for extended working with an expert opinion, usually at consultant level, being available 24 hours a day. However, there is little point changing diagnostic services to undertake investigations and generate reports for up to 18 hours a day if those who make decisions based on those test results do not work to a similar time frame.

18. A 2010 survey from the Royal College of Physicians (RCP) recommends that hospitals increase the availability of senior doctors in acute admissions units, particularly at weekends [11]. The report found that many very ill patients admitted to acute medical admissions units were only seen once a day in a formal ward round, instead of the recommended two daily ward rounds. Nearly three-quarters of hospitals in the survey had no cover from consultant physicians specialising in acute medicine over the weekend. Only 3% of hospitals provided weekend cover (9 – 12 hours a day) from consultant physicians specialising in acute medicine and none for over 12 hours. In an accompanying statement, the RCP recommended for the first time in 2010 that consultant physician cover should be available in hospitals every day for a minimum of 12 hours per day.

19. For many hospitals, capacity issues for imaging departments have provided the incentive to move to 7 day working for both elective and emergency work. Such changes in imaging can act as the catalyst for other services across the hospital to follow.

20. Where imaging services have become established across all 7 days of the week, routine elective services can follow, for example, orthopaedic clinics requiring plain film services or one-stop hematuria clinics with x-ray and ultrasound availability.

Reasons for Changing to Working 7 Days

Patient Safety

21. Several studies have identified higher mortality for patients admitted as emergencies at the weekend compared with emergency admissions during the week, but most have focused on specific conditions, for example, aortic aneurysm, cancer, duodenal ulcer pulmonary embolism and stroke. A 2010 study by Pasupathy et al. looked at the risk of neonatal death at term in relation to time and day of birth and found that delivering outside of the normal working week was associated with an increased risk of neonatal death from intrapartum anoxia [12]. This has been linked to the fact that hospitals have reduced staff and specialised services during those periods. Some authors have defined this phenomenon as the "weekend effect." However, more research is needed before any firm conclusions can be drawn about the causes of the apparent increase in mortality rates [13, 14, 15].

22. A 2010 paper by Aylin et al. from the Dr Foster Unit and the Department of Acute Medicine at Imperial College London, is the largest study published on weekend mortality and showed that the overall adjusted odds of death for all emergency admissions was 10% higher in those patients admitted at the weekend compared with patients admitted during a weekday [16].

23. Other factors, such as how quickly the initial diagnosis was made and the timeliness of access to diagnostics and therapeutic interventions, was also thought to influence the outcome of an admission. The authors, those of an earlier 2001 study Schmulewitz both suggest that the implementation of an acute medical admissions unit with consistent staffing levels 7 days per week and 24 hour access to diagnostics may have helped address the discrepancy in care suggested by other studies [17].

24. Barba et al. (2006) suggest several possible explanations for the increased mortality statistics at weekends in their hospital including [18]:
    - fewer staff who also often have less experience and may be less familiar with the patients;
    - less accessibility to certain resources (laboratory, radiology, consultants);
    - weekend staff;
    - many healthcare services require highly technical skills that only specialists can provide;
    - working on the weekend is unpopular and more costly to provide.

Reduced Length of Stay

25. Not only does improving access to diagnostic imaging improve patient safety and experience, it can reduce costs and length of stay. 7 day working can aid workflow within imaging departments; for example, on Monday mornings it is normal to see in-patient workload left over from Friday and the weekend that could not be delivered on the same day. This impacts not only on the Monday but also on the rest of the week as departments struggle to "play catch up".

26. Over recent years, insufficient capacity in key areas such as CT, MRI and ultrasound during routine hours has led to costly waiting list initiatives in order to keep pathway waiting times within a specified timeframe. There is also emerging evidence that imaging within the first hours of an acute admission reduces length of stay.

27. One NHS Trust has dramatically improved the diagnosis and management of cardiac failure in acute admissions by providing cardiac ultrasound in the medical assessment unit. This service, provided by a general physician with an interest in cardiology, allows for rapid assessment of a patient's cardiac function and adjustment of drugs reducing the length of stay for older patients in cardiac failure or avoiding admission completely.

28. Many NHS Trusts have looked at the delays in diagnostics for patients presenting with a potential diagnosis of deep vein thrombosis. For many, a catalyst for this has been the rising cost of anticoagulants prescribed in A&E whilst waiting for a definitive diagnosis. Further investigation of the pathway in one NHS Trust showed that the mean wait for ultrasound was 5 days with some patients requiring 10 days of anticoagulant therapy whilst waiting for the diagnostic ultrasound. In these circumstances, it is very difficult for junior staff to take the risk of sending patients home. Imaging departments do not see this as an emergency and the ultrasound service is not usually provided at weekends or regularly during the week, which leads to long and very variable waiting times. A 7 day ultrasound service for possible deep vein thrombosis reduces cost.

29. All patients presenting with a potential diagnosis of pulmonary embolus, a complication of undiagnosed deep vein thrombosis, are admitted for history, examination, blood gases, electrocardiogram (ECG) and blood tests. If the results of these tests suggest a potential diagnosis of pulmonary embolus, the patient has to wait for a CT pulmonary angiogram. They are often anticoagulated in the meantime as none of the previous tests are specific enough to exclude the diagnosis. Many NHS Trusts now accept the need for 7 day working for possible pulmonary embolus to prevent unnecessary treatment and admission.

A Clear example of the need for change

The table below shows a real in-patient journey of an articulate, 78 year old with known gall stones. The days highlighted were when nothing significant happened in this patient's care. It took 6 days between the request for a liver scan and the scan being performed and a further 8 days from request to Endoscopic Retrograde Cholangiopancreatography (ERCP). During the 18 day hospital spell the patient spent a considerable length of time nil by mouth and on a drip. During this time he lost 1.5 stones in weight and had a fall. On discharge he was frail, distressed and weak. His family were frantic and feeling helpless.

A move to providing all healthcare services 7 days a week would potentially have reduced this patient's hospital stay by at least eight days. Imaging with ultrasound on the day of admission would have removed seven days from the pathway. Revaluation of booking procedures and equipment maintenance schedules could remove four days of his stay.

0	Tuesday	Admitted via A&E – chest & abdominal pain
1	Wednesday	Liver scan requested
2	Thursday	-
3	Friday	Bank Holiday
4	Saturday	-
5	Sunday	Deteriorated, jaundice, pancreatitis – urgent CT scan
6	Monday	Bank Holiday
7	Tuesday	Ultrasound scan performed
8	Wednesday	MRI scan performed, suggested urgent ERCP
9	Thursday	ERCP requested
10	Friday	-
11	Saturday	-
12	Sunday	-
13	Monday	-
14	Tuesday	Prep for ERCP – cancelled – list too full
15	Wednesday	Informed ERCP booked for next day
16	Thursday	Prep for ERCP – equipment failure
17	Friday	ERCP performed
18	Saturday	Discharged

Patient Choice

30. A review of the literature showed that whilst the policy of offering patients a choice of provider is valued by patients, there is little published information about patients'

willingness to attend imaging services out of conventional working hours. Anecdotal evidence suggests that this is variable and dependent on a variety of factors including location of the healthcare facility, season and public transport availability.

31. The February 2010 Report on the 'National Patient Choice Survey, England' found that a hospital close to home or work was selected most often (by 38% of patients offered choice) as the single most important factor when choosing their hospital [19].

32. If hospitals are to offer weekend/evening appointments then ensuring the best use of that time will be key. There is anecdotal evidence from cancer patients that any reduction in time waiting for a diagnosis, even if it does not affect treatment or outcome, has a significant positive impact on psyche, even if that reduction is only a few hours or days. Patients waiting for tests to diagnose a serious disease such as cancer are even more likely to attend weekend appointments than those who are just having routine tests.

33. For example, an audit of physiotherapy out-patient services in north east England showed that patients preferred an appointment before or after work and felt that weekends were 'family time'.

Patient Choice

When a patient is referred by their GP either for a scan or to a consultant who subsequently refers them for a scan, that patient will be worried. Their priority will be to get the scan as soon as possible. In my view many patients will be prepared to attend out of what might be considered 'normal hours' to produce a quicker resolution. The same would apply to geography and they may be prepared to travel further for an earlier appointment.

The period between having the scan and getting the result is the period of highest anxiety. In my case my consultant's secretary has phoned me at home in the evening when she was typing the letter to say all was well! This was appreciated. Thus, both the time from referral to scan and time from scan to result are important but from the patient perspective, the latter is even more important.

When it comes to treatment, geography is perhaps more important. If the patient is to have an operation, then being close to friends and family is a benefit. However, that benefit could be outweighed by the availability of specialist treatment further from home, offering a better chance of a successful outcome.

Where there is regular follow up out-patient treatment then again a local solution becomes very desirable. A Patient

Choice of Diagnostics

34. *Equity and excellence: Liberating the NHS* (2010) sets out the Government's strategy for the NHS. It states that from 2011 the intention is to begin to introduce choice of provider for diagnostic tests. International evidence has shown that involving patients in their care and treatment improves their health outcomes, boosts their satisfaction with services received, and increases not just their knowledge and understanding of their health status, but also their adherence to a chosen treatment [20].

35. In order to give patients a choice of healthcare service, organisations will have to operate with some flexibility of capacity. This means that workforce and resource planning will have to be tackled differently to ensure the service is more responsive.

Any Qualified Provider (AQP)

36. AQP is a model that offers patients a choice of who provides their care from a list of qualified providers. The aim of extending Any Qualified Provider is to improve quality of services by increasing the choice and control patients have over their care and treatment. The approach has been shaped by the listening exercise announced in April 2011 on NHS modernisation plans; we will adopt a phased approach, introducing choice of provider where this will result in better patient care. We published guidance to the NHS in July 2011, setting out plans to extend patient choice of provider to a range of community and mental health services from April 2012.

37. Having a choice of provider, may benefit organisations which demonstrate high levels of quality, responsiveness and user satisfaction. This model has the potential to enable healthcare services offering 7 day working to be preferentially selected by patients. Where a provider meets defined criteria and has been qualified, they may list their services on the national Choose and Book menu, which is configured for imaging services.

Commissioning Services

38. An important role for commissioners of healthcare services is to reduce inequalities in healthcare provision. They also have a duty to improve the quality of services including patient experience, safety and effectiveness.

39. Imaging services are encouraged to engage with their local commissioners and authorities to discuss how to offer the highest quality and most efficient healthcare services to their population. As described throughout this guide such healthcare services will want to consider 7 day working as part of this process.

Public & Patient Expectations

40. The NHS has made great importance in putting patients at the heart of healthcare services it provides. Healthcare services are now being built more around the needs of their patients, rather than the convenience of staff who work in them.

41. The White Paper *Equity and Excellence: Liberating the NHS* states that:

> *'The NHS also scores relatively poorly on being responsive to the patients it serves. It lacks a genuinely patient-centred approach in which services are designed around individual needs, lifestyles and aspirations. Too often, patients are expected to fit around services, rather than services around patients. The NHS is admired for the equity in access to healthcare it achieves; but not for the consistency of excellence to which we aspire. Our intention is to secure excellence as well as equity.'*

42. Extrapolating this to imaging services leads naturally to an assessment of 7 day access for patients to a much wider range of healthcare services than currently provided.

A 2010 report by The Kings Fund documented that [21]:

> *'In future if there is more direct access to diagnostics and consultant advice, GPs may be referring fewer patients to hospital and may be more likely to be referring for treatment rather than diagnosis when they do so. This could change the nature of the referral consultation and make it more likely that GPs will be willing and able to engage patients in a decision about where to refer.'*

Importance of good patient experience

I went for a routine x-ray where they found a 'significant mass,' which the doctor said was likely to be cancer. I was offered an appointment on the upcoming Saturday, but if I needed a weekday appointment then it would have been 4 days later. I took the Saturday appointment, and on arrival I was booked for CT scan on the Monday, had bloods taken in out-patients and sent straight to ultrasound for a guided chest biopsy. I felt that things were being progressed quickly and efficiently and it helps me to feel that everything possible was being done in the shortest space of time.

A patient

43. For some in-patients to be seen for example on Saturday evening with results from imaging tests earlier on Saturday could enable a Sunday discharge rather than Monday. This would be preferable for the patient and would free up a bed one day sooner, saving money for the NHS.

44. Extended day working may also be beneficial to patients who work shifts and could allow working parents to attend with their children for paediatric appointments without having to take time away from work, nor the children from school. Consideration also needs to be given to the savings for parents of time off work when accompanying children to multiple appointments, for example Ear Nose and Throat (ENT) or orthopaedics, which may need repeated attendances for treatment and follow up. Also, older people being cared for by relatives that work and need to accompany them.

Service Management to Deliver 7 Day Working

45. Changing the way a healthcare service is delivered is not a simple process. Changes to the way a whole service is delivered requires the engagement of, and extensive consultation with, staff at all levels. It takes exemplary leadership and management skills, thorough and deliberate planning, piloting and auditing. It also takes time and patience. It is essential to consider the skill set of the workforce before implementing change of this magnitude.

Leadership

46. Many radiologists argue that there is no point in providing a 7 day service if their consultant colleagues in other specialties are not available to act on the results of the investigations. Thus, many hospitals experience a stalemate that benefits no one when initially exploring this issue. If it can be agreed that someone senior takes the lead then the evidence indicates a much improved service for patients. Specific workforce issues are explored further in the later section on workforce.

The need for whole team change

When we started our weekend service 11 or 12 years ago, there were not regular physician and surgeon ward rounds at the weekend. It quickly became apparent that nothing much happened after initial diagnostic tests and that there was no improvement in the process as a whole.

We therefore soon established fixed sessional working for consultant physicians and surgeons at the weekend. This led to much better flow throughout the system with less bed blocking and reduced length of stay. We have also, for years, had fixed working at weekends for consultants in other specialties such as Intensive Therapy Unit (ITU).

Consultant Radiologist

Management Skills and Planning

47. Evidence suggests that using ‘averages’ in planning imaging service provision is always an underestimation of the actual requirement. Well-established queue theory and service management in other sectors have also shown the danger of planning capacity based on the average with the effect that on 50% of days, patients will not receive the service and will wait [24]. Queue theory and modelling supported by practical NHS experience has shown that it is not possible to ‘catch up the next day’ (i.e. 1 day delay). The probability of the next day being a ‘below average day’ is only 50%, so waiting times are unpredictable and far longer than the service planned for. Clinicians have ‘adapted’ to the law of averages in their planning process, by ‘triaging’ or prioritising. This wastes valuable resources both in the triaging process and in storing patients upstream of the queue. Unfortunately, reserving capacity for more urgent patients makes capacity less effective, creating a vicious circle of increasing delay, risk and reduced efficiency. Work undertaken

by NHS Improvement has shown that efficient scheduling of appointments can have significant benefits and shorten the patient journey. There are opportunities to improve efficiency by examining whether opening hours are appropriate and whether a better use of resources could be implemented, for example by introducing shift working. See case study examples on the NHS Improvement website.
http://www.improvement.nhs.uk/diagnostics/RadiologyCaseStudies/tabid/64/Default.aspx

48. Moving from a 5 day imaging service to a 7 day service is not just a case of spreading what you already have a bit thinner. It is essential to understand the imaging service you are currently providing before embarking on change. It is equally important to understand the requirements of your service users, in terms of staff outside of imaging and patients.

49. It is not enough just to provide additional imaging services. Support services also need to be considered, for example porters, reception and secretarial support, especially in the absence of digital dictation or voice recognition software to facilitate reporting. It is also essential to ensure toilets are re-stocked and cleaned over the weekend and that the coffee shop/restaurant is open for both patients and staff.

50. Imaging staff need to understand the need for change and be encouraged to become involved to get the best outcomes for all. The change has to be seen to be fair and all staff in all staff groups need to be included in its outcome. Historically some staff may have worked extended day and weekends and others may not, but in any new way of working, the responsibility is best shared across the whole staff group.

51. A thorough review of the skill mix of staff across the department needs to be undertaken to ensure the most appropriate person is undertaking tasks. Process mapping and tools such as 5S[1] should be employed where relevant to eliminate waste and standardise procedures.

Mobilising Change and Motivation

52. It is usual that the people doing a job, given the right tools and support, know most about how to make improvements happen and want to make things better. They want to fix problems and make a difference. It is not enough just to raise awareness or tell people about how a significant change such as 7 day working will happen. Staff are an active part of a change process in order to own the final outcome and make it successful. There are many examples where organisational change has not been sustained because external bodies start to drive the change, rather than the staff from within a department owning and leading the process. The conflicts between ‘pushing’ and ‘pulling’ a workforce can be summarised as follows:

[1] Sort, Set, Shine, Standardise, Sustain

53. It is not enough to:
    - push staff through training without continuous application of the knowledge they have acquired;
    - push communications within the broader organisation, before exploring opportunities to discuss and address local or departmental problems, expectations and challenges;
    - push so called experts on to teams, rather than expecting managers to be able to stand alongside and lead their team.
54. Some push may be required, but consideration should be given to:
    - pulling people into improving the processes of their own area because they themselves see the need to improve;
    - developing skills through hands-on delivery of change processes, facilitating learning and discussion, not only within the team but also with other teams.

An example of local imaging service change

We have 7 day working in most imaging modalities, but it has taken us a few years to get here and will take another few to get to a point we think is satisfactory. We don't have a full shift system in place in any imaging modality. We tried it in some areas, but found it difficult to maintain. Negotiating with staff can be prolonged, but we generally find that if we give staff some flexibility and ask them to come up with the solution we can get to a satisfactory end point. We still have a small number of people who, due to other responsibilities will be unable to be flexible and because we are a big NHS Trust we can work around that at present. It has proved much easier to bring in new staff on flexible contracts and then the others tend to follow suit, so we have enough cover.

We find that many patients don't like coming for appointments at 8am and need to be persuaded, but they like the evening and weekend sessions. GP patients don't tend to turn up much after 7pm.

CT has 12 hour shifts Monday to Friday 8.00am to 8.00pm, with Saturday and Sunday 9.00am to 1.00pm. Monday to Friday is on a shift and does not cost anything, but we pay overtime rates for Saturday and Sunday for both radiographers and consultants. We had to negotiate this change with radiographic staff and we also negotiated with consultant staff, but with consultants we included an evening session in their contract with each new post we advertised over the last few years to ensure we would be able to achieve this. We are now at the stage where we have more than 1 consultant on duty some evenings, so that gives us more flexibility with the work we do.

We provide MRI the same hours as CT, but we pay overtime for evenings and weekends. We are currently negotiating with the radiographers to change to a shift pattern and as we recruit to new posts we have started to include a weekend or evening session as part of the normal hours.

> Our plain film department is open 12 hour days Monday to Friday and Saturday mornings. This is what GP and clinic patients told us they wanted. We x-ray in-patients routinely up to 8pm each evening and GP and clinic patients just walk in - we have no appointments.
>
> We are currently progressing changes in ultrasound. Currently there are a few evening sessions each week and Saturday mornings, but no regular Sunday service apart from on call.
>
> Directorate Manager Imaging Services

Use of Data

55. In order to plan services the NHS needs to have a clear indication of the benefits, the costs and the timeframe implied by such service changes as 7 day working. This should include evidence of where "spending now to facilitate savings later" should be considered. This information on costs and benefits needs to be considered in light of the NHS needing to make £20 billion of savings by April 2015.

56. It is important to have a clear goal, agreed priorities and measurable outcomes. A traffic light system of markers, statistical process control charts and dashboards can all be effective tools and a useful way to motivate staff.

Data and Diagnostic Imaging

57. The Department of Health monthly dataset includes the number of patients waiting for 5 key imaging tests, CT, MRI, Dual Energy X-ray Absorptiometry (DEXA), ultrasound and barium enema. These tests were selected because at the beginning of the data collection exercise, they had examples of particularly long waits across England. Some NHS Trusts outsource image acquisition +/- image reporting to the independent sector, so the number of machines being used to deliver the activity described by this data is unclear and we are not able to reliably measure machine utilisation. This data can be used at a local level to evidence the need for and plan service change.

58. There is also a more detailed annual Department of Health data collection KH12 which counts total imaging activity. The NHS counts, rather than measures, performance. Examples of counting include the documenting of activity and the number of examinations or patients 'processed' in a given time frame, but this does not describe the process. On the other hand, measuring can provide useful information e.g. the intervals between patients requesting a service and real time measuring allows the rate of production to be adjusted instantly and appropriately.

59. Measuring the interval between request and the variation in the interval for a procedure to be performed allows a service to plan capacity and cost. The rate of demand can be matched to the rate of supply and hence the hours of work required. If the capital depreciation cost, salary cost, and the variable costs are known this gives a fast and

accurate way of planning cost and defining price (income). Methods such as this should be used as part of the business planning process when moving to 7 day working.

Coding can be used to 'apportion' cost of activity:

$$\frac{\text{cost}}{\text{activity over a given period (e.g. year)}} = \text{unit cost of procedure.}$$

Counting & Coding

60. To facilitate effective planning and preparation of business cases to extend existing imaging services, an understanding of how healthcare is counted and coded is vital.

Office of Population, Censuses and Surveys Classification of Surgical Operations and Procedures (4th revision) (OPCS4)

61. OPCS-4 is a mandatory NHS data standard that translates operations and surgical procedures into codes. It was implemented across the NHS in 1990 and has formed the basis for the recording of clinical procedures ever since. The development of a new national intervention classification to replace OPCS-4.2 began in 2003. In April 2005 the strategy was revised and redirected to enhance OPCS-4 to create OPCS-4.3. The latest update OPCS4.6 has been implemented from April 2011. The project was initially to meet the needs of the Department of Health Payment by Results (PbR) programme which relies on detailed and accurate coding. A regular review ensures the classification remains up-to-date and reflects current medical practice in the NHS. There are OPCS codes for imaging services and these are underpinned by more detailed SNOMED CT (Systematized Nomenclature of Medicine Clinical Terms) coding.

Payment by Results (PbR)

62. PbR provides a transparent, rules-based system for paying NHS Trusts. It rewards efficiency, supports patient choice and encourages activity as payment is linked to activity and adjusted for case mix. Importantly, it ensures a fair and consistent basis for hospital funding. PbR also encourages incentives to ensure improved performance and accountability.

63. In 2011 there are published non-mandatory tariffs for direct access imaging tests (those referred from primary care) and several best practice tariffs to promote the use of specific procedures. Otherwise the cost of imaging is included in the tariffs for outpatient attendance and admitted patient care spells (described by HRGs, as below).

Healthcare Resource Groups (HRGs)

64. HRGs are standard groupings of clinically similar treatments which use common levels of healthcare resource. HRGs support PbR by providing a classification framework that represents current clinical practice and provides a means of categorising the treatment of patients in order to monitor and evaluate the use of resources.

65. HRGs offer organisations the ability to understand their activity in terms of the types of patients they care for and the treatments they undertake. They enable the comparison of activity within and between different organisations and provide an opportunity to benchmark treatments and services to support trend analysis over time. Reference costs are calculated for each HRG by NHS Trusts and reported annually to aid accurate tariff development.

66. Further updates on PbR for 2011-12 can be found at: www.dh.gov.uk/en/Managingyourorganisation/NHSFinancialReforms/index.html

The Importance of accurate data

Five years ago our interventional radiology department was understaffed and heavily criticised for being expensive and inefficient. We had a ridiculously heavy workload and were undertaking a lot of work for other NHS Trusts who referred all their high cost out of hours work to us. We were seen as a drain on the resources of the general radiology department.

With a new Chief Executive we made a case that we needed to ensure that the income for managing patients was correctly recovered. We did not have the basics correct and the wrong HRG was being generated if one was being generated at all. The wrong tariff or no money was flowing back into the unit. Part of the mechanism for correcting this was to get the right OPCS and ICD 10 codes, used to generate the appropriate Healthcare Resource Group (HRG), for a patients spell.

Our hospital coders were typically under-recognised for the importance of the complex work that they did. It is essential that they understand the work that a speciality like radiology does, that they are given the correct information, and that a dialogue is developed between the clinicians, business manager and coders to ensure that the coders understand the work and the business managers check that the unit is being paid appropriately. Our case was accepted and a clinical coder was assigned to the department. All patient episodes are now coded correctly. We are seen as a major success story in the NHS Trust. We now have 6 consultants delivering a 24/7 elective and emergency service with a full complement of nurses and radiographers. We have just opened a day case unit and are able to save the NHS Trust significant resource in terms of bed, theatre and ITU occupancy. We are now actively seeking to deliver services to surrounding NHS Trusts.

Consultant Interventional Radiologist

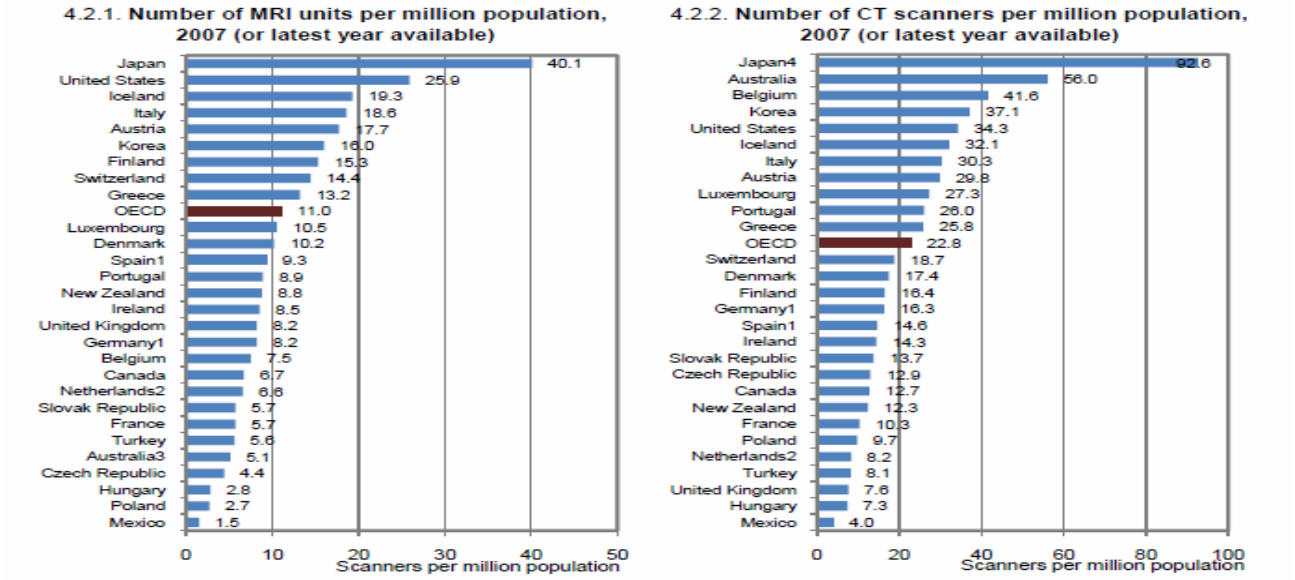
Equipment

67. Diagnostic imaging equipment is one of the most significant capital investments for the NHS so it is imperative that it is used efficiently. 7 day working can optimise use of this expensive resource and any proposal for 7 day working should include an assessment of equipment usage, replacement plans and workflow [25].

68. In recent years considerable progress has been made by equipment manufacturers to reduce CT and MRI scan times using new technologies and protocols. This has aided better workflow in imaging departments. However, working longer hours and increasing equipment use will necessitate more frequent replacement of some equipment than is current practice. For example, x-ray tube life is exposure dependant so longer working hours will mean more frequent servicing and equipment replacement for CT scanners, interventional radiology and plain film x-ray equipment.

69. In 2000 the Department of Health introduced a centrally funded programme of new capital equipment to increase the number of CT and MRI scanners, yet despite this increase in equipment England still has fewer machines than some comparable countries.

70. Number of MRI & CT Scanners per Million Population (2007)



1. Data for Germany and Spain only include equipment in hospitals.
2. The figures for the Netherlands under-estimate the real number of equipment, because they refer to the number of hospitals reporting to have at least one of these equipment rather than the total number of equipment in hospitals and in the ambulatory sector.
3. In Australia, data for MRI units relate only to those eligible for reimbursement under Medicare.
4. In Japan, data for CT scanners relate to 2002 rather than 2005, because the 2005 data is more limited in terms of coverage of institutions and type of CT scanners.

Figure 1

71. It is essential that all NHS Trusts ensure they are making the best use of existing capacity. However, as the main measure of efficiency currently used is waiting times, with limited activity data, comparisons and measurement of unit cost are difficult. This means

commissioners and managers of imaging services find it difficult to compare the efficiency or cost effectiveness of services offered by different providers unless specific questions are asked about machine usage.

72. The recommended expected useful life of a MRI, CT or ultrasound machine is between seven and ten years. As imaging equipment ages it becomes increasingly expensive to maintain, with more downtime and less reliable performance. The use of equipment for 7 days a week will necessitate more frequent servicing and replacement.

73. Interventional radiology (IR) is the use of imaging guidance to gain access to various internal organs for both diagnostic and therapeutic purposes. During the last two decades, IR has increased in clinical importance as IR procedures replace traditional surgical techniques bringing many benefits to patients and to the health service. IR techniques can usually be performed in a specially designed suite similar to an operating theatre, on an out-patient basis or with an overnight stay in hospital, resulting in substantial financial savings. The Department of Health has produced two reports on IR which describe service changes needed. [26, 27, 28].

74. The National Audit Office report *Managing high value capital equipment in the NHS in England* (2011) has recommended that NHS Trusts should look critically at the arrangements they have for meeting the demands for scans and radiotherapy. A move to 7 day working should include a review of equipment use, skills of staff and working patterns necessary to maximise the most effective use of these machines.

Teleradiology

75. It is possible to outsource some elements of imaging service provision, particularly some out of hours services, to independent sector providers. Experience shows that this raises issues of professional trust, most noticeably from clinical colleagues within a NHS Trust. Third party reporting by off-site radiologists also produces challenges for the 'home' radiologists involved in multi-disciplinary meetings and can lead to duplication of effort in these cases. When reporting imaging examinations, there is a requirement for previous images and clinical information, which may be harder to guarantee if using teleradiology services [29, 30].

76. Outsourcing to other NHS or independent sector institutions who have the capacity to take on additional work will result in the transfer of large amounts of data. To deliver more joined up IT services, the NHS should consider shared worklists of current information technology. Information governance is also an important consideration when patient data is shared across organisations. The informatics issues to consider are described below.

77. Local resources including local networks are often the preferred option. Groups of NHS Trusts working collaboratively may be an option for the provision of shared out of hours work although this too is not without its difficulties. One issue is the potential divide (real or

perceived) between district general hospitals and teaching hospitals. New consultants could be appointed such that part of their contract is within a collaborative network.

Co-dependent Services

78. If hospitals are going to be open and offering a service, then there is a need to have the surrounding infrastructure to support this. The managerial team leading a change to 7 day working for imaging have to be cognisant of these broader issues.

79. For example:
Most local authorities, especially the more rural, run greatly reduced services at weekends, especially on a Sunday. A move to 7 day working in hospitals will require discussion with local government and health and well-being boards on issues such as:

- Patient and staff access to public transport services;
- Childcare facilities so parents are able to attend for appointments or procedures over the weekend or in an evening;
- Staff childcare arrangements to facilitate working in the evening or weekend;
- Hospitals will need to provide additional catering facilities for staff and patients to support new opening hours;
- Other clinical and support services will also need to be considered if 7 day working extends outside the diagnostic services;
- Other secondary care services and also the wide variety of services needed to facilitate discharge at weekends;
- Ancillary staff, such as booking clerks and porters, are key to the delivery of an efficient service.

Informatics to Support 7 Day Working

80. A glossary of the key terminology pertaining to Informatics is included at Appendix A. The information technology contribution to meeting the challenge of 7 day working can be broken down into three broad areas:

    Ensuring informatics support that underpins the 'office hours' service and enables extension into the weekends and evenings, without loss of efficiency and without adding risk.

81. While radiology and radiography staff are familiar with 'out of hours' business, administrative staff may be less so, and vetting, booking and scheduling processes may be adapted. Clinical workflows which use a mix of IT and manual processes that work well in office hours e.g. Direct Booking from GPs may require additional configuration of IT systems to ensure they work in the more sparsely resourced extended working environment.

82. The quantity and quality of IT support to imaging departments could be reviewed to ensure a comparable level of service at weekends and weekdays. Access to IT systems and appropriate training for 'last-minute' locum staff, typically more likely to be working during evenings and weekends, will be needed if they are expected to order diagnostic tests and act on the results.

83. Smart decision support systems, preferably integrated within electronic requesting systems, are currently being considered by many. These have been demonstrated to reduce inappropriate use of imaging and increase the appropriate use of imaging, particularly relatively high cost modalities such as CT and MRI. The increased focus on effectiveness and value for money from extended working of diagnostic imaging departments are likely to increase the desirability of such systems.

84. Safety critical clinical processes e.g. notification of unexpected results and multi-disciplinary teams (MDT) discussions could be of similar robustness at weekends with appropriate involvement of senior clinicians. This may necessitate the provision of image review facilities at the homes of a wider group of clinicians than is currently necessary.

85. Business continuity plans at weekends will have to be scaled up to reflect the additional volume of routine work that may have to be relocated, scheduled, booked in and reported.

    Flexibility and capacity to support different clinical ways of working within individual organisations.

86. Prioritisation of demand, though always desirable, becomes much more important during evenings and weekends when resources are relatively scarce. The Ordercomms

Radiology Information Systems (RIS) – Picture Archiving Communications System (PACS), Patient Administrative Systems (PAS), bed management system and portering systems could be designed so that appropriate worklists are generated, enabling the right in-patients to be imaged and reported in the right order. Typically this will be:

- time critical accident and emergency patients;
- clinically urgent in-patient investigation;
- in-patient investigations required to minimise unnecessary IP waits and enable appropriate prompt discharge.

87. Weekend capacity can also allow for elective out-patient work. The acceptability of weekend appointments is likely to vary between patient groups and differing organisations, depending on such factors as location and parking facilities. One NHS organisation is piloting an automated appointment reminder and rescheduling system in which a computer system substitutes for the human agent and calls a patient before their appointment to check that they can still attend. If there is a problem then it can reschedule a convenient appointment there and then.

88. Remote reporting for radiologists from home and ideally from other locations will facilitate effective use of the workforce over the whole week. The shift from emergency review to 'business as usual' reporting implies enhanced viewing and image data manipulation capabilities. (See Appendix B for a technical overview of differing kinds of viewing provision.) The likelihood that such remote access may also be required for complex data manipulation, multiplanar and 3D reconstructions and fused imaging e.g. positron emission tomography - computed tomography (PET CT), will add significantly to the demands made of PACS and their web applications. Radiologists will require access, much more than presently, to RIS for reporting. This will ensure that reports are widely available to the relevant clinicians in near real-time at weekends and evenings. It will also avoid a potentially burdensome administrative backlog on Mondays or the following morning. This approach needs to be both cost and quality effective for patients, referrers and NHS Trusts.

89. It is likely that there will also be a demand for remote visualisation of images for non radiology clinicians with the ability to review diagnostic images from home, for example for orthopaedic surgeons, accident and emergency physicians and others despite, and as a complement to, an on-site presence of senior clinicians in the evenings and weekends.

Enabling collaborative networks for routine, as well as urgent clinical workflows.

90. The range of specialist radiological opinions within each organisation during evenings and weekend working will be considerably reduced, compared to the current situation where there is a relative surplus of different skills at peak times during the working week. In order to maintain an equivalent high quality and timely service across the extended service, pooling of skills, across a wide area network, could be considered. This results in a requirement to reproduce, across organisational boundaries, the reporting worklist functionality that currently exists within individual organisations.

91. The current national solution to enable digital image sharing is the Image Exchange Portal (IEP), a web-based application that allows healthcare professionals to securely transfer patient images from one NHS Trust to another. The system has been deployed since January 2010 and is currently used by 180 organisations. Significant benefits are already being realised for both NHS Trust staff and patients with over 2,500 sets of images being transferred daily between different healthcare providers. The IEP was designed to eliminate the costly production of CDs and to provide fast and efficient access to previous imaging. This has streamlined radiology reporting and continues to improve the patient experience.

92. A variety of strategies have been implemented to improve cross-organisational image sharing and reporting using the main existing products:
    - Image Exchange Portal (IEP);
    - Accenture PACS Connect (APC);
    - BT PACS Exchange (PEx); and
    - North West PACS Portal.

93. These all require supplementary administrative processes to ensure that appropriate images and relevant prior images are available to the reporting radiologist or reviewing clinician. Additional, often manual processes, are then required to ensure that the report gets back safely to the appropriate RIS. In the absence of true wide area capability to reproduce ‘intraorganisational’ informatics workflows, any attempt to use collaborative networks to support extended working would require significant increased administrative support. Interoperability standards that will improve cross enterprise imaging informatics, such that it can more effectively support extended working, will be needed.

94. Other challenges exist with respect to collaborative networks including financial and information governance.

The difference image sharing makes

A child suffered a head injury in a car accident and after initial treatment was transferred to a children’s hospital which needed to see his images urgently. Before

IEP we would have had to burn the images onto CD and use a taxi to transfer them which would have increased the risk to the patient (perhaps due to traffic or the CD being given to the wrong person) and also incurred a cost for the NHS Trust.

With IEP we were able to send the images to the receiving hospital within minutes and the clinicians there were able to view them straight away, make a rapid informed clinical assessment, reducing the treatment time and giving the patient the best possible chance for a full recovery.

On call radiologist

SMS Messaging

95. In 2010, one NHS Trust reduced its Did Not Attend (DNAs) rates by nearly 40% and cut out-patient waiting times following the introduction of a NHS Trust-wide interactive patient messaging service. Using mobiles and landline telephones, the system reminds patients of forthcoming appointments and enables them to quickly and easily cancel or re-arrange appointments no longer required.

96. It means that the NHS Trust (who offer 600,000 appointments a year) has been able to re-use an extra 1,776 appointments a year, which would otherwise have been wasted. This has helped to reduce waiting times and has enabled the NHS Trust to save money by scheduling fewer clinics, which are better attended as a direct result of this project.

Direct Booking

97. Direct booking for imaging examinations requires good protocols, good clinical referral information and staff with the skills to work with protocols and make appropriate appointments. Commitment of all staff, including the consultants, to support this is essential.

Direct booking

An audit of direct access requests was undertaken by imaging modality staff. It indicated very few changes were needed as a result of the direct booking referral process. It also found that the process time was longer if a direct booking referral request was undertaken by a consultant.

An agreement was reached to allow checking of requests by other staff. If a referral met an established protocol for ultrasound and CT, requests were checked after booking. Training and support was provided to enable administration and clerical (A&C) staff to book with confidence and they were encouraged, where possible, to give patients an appointment at presentation of request. The A&C staff also checked whether a same day scan was available if the patient was likely to have a problem returning to hospital.

> Ultrasound waits have fallen as a result of the improved process and capacity was increased. By March 2009, 64% of ultrasound patients were being directly booked and delays of up to 1 week have been eliminated for out-patients who present for direct booking. Booking across three sites into the next available appointment has reduced inequity across sites. Delays for CT have also been eliminated. The service has maintained a two week wait despite increased demand. We have found that very few patients change their appointment after booking.
>
> Clinical Director of Radiology

98. Direct booking also has a big impact on other hospital departments and can speed up the patient journey.

> Just to say what a great service – Before we would send CT requests in the hope you got them, not knowing when you would receive them or if you would receive them. We would not know when our patients would get an appointment; we would ask them to let us know but most never did, so they sat on our waiting list when they could have been seen earlier. Now patients go home happy with their appointment and we can give them the follow up here. We know what we are doing and the patients are a lot happier.
>
> Respiratory Admin Supervisor

Choice of Appointment

99. As the case study below shows, imaging departments, patients and their referring clinical teams all benefit from a booking system that offers patient choice. There is currently a Choose and Book Electronic Referral Service, suitable for some diagnostic tests for out-patients. The main functions of Choose and Book are that it shows what services are available that meet clinical criteria. It offers choice to patients based on short-listed services and books patients into appointments.

> **Telephone booking system**
>
> In the previous system, patients did not have choice of appointment. This led to a significant 'Did Not Attend' rate in several imaging modalities and not every list was being booked fully and efficiently.
>
> A telephone booking centre was set up which has been expanded to include all GP and out-patient bookings, except for nuclear medicine and interventional examinations.
>
> The referrer fills in a standard referral form and gives a tear-off slip from this form to the patient who then phones into the department after 48 hours to agree their appointment.

Surveys of referrers and patients demonstrate a very high level of satisfaction. There has been improved utilisation of plain film x-ray slots in multiple community hospitals, which used to be a very inefficient service and which has enabled some rationalisation of cover and reduced waiting times. By 2009 DNA rates had reduced to 1.1%.

Radiology Service Manager

The 7 Day Workforce

100. The NHS in England employs more than 1.3 million people. Of those, just under half are clinically qualified. The public sector is an important part of the 'knowledge economy' yet there is much untapped knowledge. It is important to breakdown silos and share knowledge across disciplines in order to utilise the full potential of staff, for the benefit of patients, the organisation and their own personal development.

101. The number of diagnostic scans carried out on NHS patients using CT and MRI machines has increased almost threefold in the last ten years. The workforce supporting delivery of scanning has increased, but shortfalls remain in capability to deliver services. Many NHS Trusts face resource constraints in meeting increasing demand, with vacancy rates for consultant radiologists of around seven per cent.

102. The NHS delivers patient services around the clock and it is essential to match staffing to service need in order to achieve maximum quality and effectiveness. As well as providing some imaging services over 7 days, staff will still be required to provide on call cover outside their normal working hours.

103. Imaging departments employ a range of professional and support staff and it is essential to consider the whole team. Ancillary staff, such as booking clerks and porters, are key to the delivery of an efficient service. Imaging equipment maintenance, service optimisation and quality assurance processes also require medical physicists and technical support staff.

104. A 2009 Royal College of Radiologists survey of NHS Trusts found that despite an increase in the total number of radiologists, 90 per cent of NHS Trusts used overtime arrangements to meet demand as NHS Trusts have vacancy rates for radiologists of around 10 per cent. Around half of NHS Trusts outsourced some imaging services to other providers.

105. Consideration may be given to effective use of appropriately trained non-medical staff to support 7 day working and alleviate the pressure on radiologists. The use of specialist advanced practitioner and consultant radiographic grades, who are able to function autonomously, can accelerate appropriate pathways and maximise the efficient use of skills across the working week.

106. In some hospitals, radiographers are extending their role to support patients referred from the accident and emergency department for imaging of minor injuries. An advanced or consultant practice radiographer reports on the examination immediately, explains the findings to the patient and, where there is no bone injury, treats and discharges the patient. This speeds the patient journey, reduces the number of steps in the process and avoids the need for patients to return to A&E where they would wait to be seen again before discharge.

Extended Practice Workforce Changes

Nine years ago, the NHS Trust supported the development of advanced nursing roles in our imaging department to assist in providing a vascular interventional service during core hours. As a small District General Hospital the departure of one of only two interventional radiologists meant that service provision would be severely curtailed. The training of a senior nurse to undertake diagnostic angiography supported the provision of the service and the recruitment of an additional radiologist meant that service provision was possible throughout core hours, including times of annual/study leave.

Similarly back in 2004 the department recognised that capacity for hysterosalpingogram did not meet demand or have the flexibility of appointment provision required for this procedure. A senior nurse trained to provide this service and this was extended with the training of a senior radiographer.

Our previous experience with advanced practice had demonstrated the potential to support radiologists in service delivery and with an ever increasing demand, the acknowledgement that Monday to Friday service provision was not always available. The senior nurse now performs additional procedures previously undertaken by a radiologist.

The provision of this advanced practice role by the senior nurse allows the radiologists to be able to maintain their job plans and promote the delivery of service throughout the radiology department.

Radiology Nurse

Non-Medical Staff Contractual Issues

107. Non-medical staff would be paid enhanced rates for any unsocial hours worked. Unsocial hours are paid on a weekday after 8pm and before 6am and at any time on a weekend or bank holiday. Staff working over and above agreed hours would be paid for those hours, for full time staff this rate will be enhanced. If the work is considered to be ‘on call’ this would also attract an on call payment in line with either national or local arrangements.

108. Local consultation and negotiation with trade unions and staff would be required to alter working hours of non-medical staff and any additional payments confirmed. Some staff groups already provide 7 day services and variation to their working pattern or workload would be considered routine. However, staff groups such as sonographers, or those in smaller district hospitals where 7 day service provision has not traditionally been the norm, would require sensitive handling.

Medical Staff Contractual Issues

109. The job planning process is an opportunity to look at current working practices and to consider alternatives in order to deliver high quality services. It is key to providing a flexible service, increasing capacity, using resources more effectively and enhancing productivity. It can be an opportunity to think about the ways in which doctors work and the way services can be organised and provided. For example, many training problems since the implementation of the European Working Time Directive could be solved with a three session day and weekend working. Where partial rotas are less than one in twelve, the three session day allows one to one teaching without breaking rules.

110. The majority of consultant radiologists in imaging departments take part in an on call rota. Since the implementation of the consultant contract there has been greater transparency about the number of predictable and unpredictable hours worked at weekends. Under the terms and conditions of the contract [31],

> *'Non-emergency work after 7pm and before 7am during weekdays or at weekends will only be scheduled by mutual agreement between the consultant and his or her clinical manager. Consultants will have the right to refuse non emergency work at such times.'*

111. Work in these times is considered premium rate i.e. three hours per programmed activity rather than four hours 7am – 7pm Monday - Friday. Time spent carrying out teleradiology from home and travel to and from the NHS base to view and report images, or to carry out procedures, is included in out of hours work.

112. Many departments include a 'semi-urgent' list, e.g. in-patient CT or ultrasound, as a regular 'predictable' component of weekend work. If there is a will within a department to move towards weekend working, a modest extension of such 'on call plus' type activity can make a significant contribution.

113. For example, it was not unusual for consultants moving onto the new contract to be in receipt of an historic 'one session for being on call' payment. If this was reflected in a job plan under the new contract, depending on arrangements for weekday evening and overnight cover, it could allow for six to eight hours work on Saturday and Sunday on a typical one in eight rota.

114. Experience shows that many consultants prefer having a scheduled presence in the hospital at weekends, compared with interruptions and intermittent, often suboptimal teleradiology, phone conversations and travel.

115. Some organisations schedule a day's work on Saturday and Sunday incorporating out-patient CT and ultrasound lists and/or hot film reporting, together with urgent and 'same-day-next-day' in-patient work. This level of input often raises the need to consider

compensatory rest e.g. a day off in lieu on Monday not only to comply with the European Working Time Directive (EWTD), but also as a common sense barrier against fatigue and suboptimal performance during the following week. If the same staff are providing cover during weekend nights then it will usually be impossible to provide significant scheduled activity during the weekend days without breaching the EWTD. A common solution is to outsource night time CT scanning to an independent sector provider to guarantee the required uninterrupted rest.

116. Changing to a more or less full shift pattern, where a more complete range of in-patient and significant out-patient provision is provided at weekends without a corresponding expansion in consultant staff, tends to result in individual consultants performing and reporting a much wider range of studies than is typical in a 5 day week environment. This can cause its own challenges in job plan discussions if, for example, a relatively specialised consultant is required, perhaps with one or two other colleagues, to process the whole range of requirements at weekends in the interest of 'doing the day's work today' and improving turnaround times.

Managing the Change to 7 Day Working

117. Providing the advantages and disadvantages of these different ways of working are understood, most organisations will be able to come to a mutually satisfactory arrangement by negotiation. Job Planning is an evolving, ongoing and important activity which should link strongly to organisational needs. Consultants should be aware that a 'good faith' change in ways of working, if documented in a mutually agreed job plan can, over time, become 'normal practice' and this acquires 'implied' contractual or quasi-contractual force. If individuals dispute suggested changes, the necessary appeals process is set out in the terms and conditions of the consultants contract.

118. In some instances, implementation of weekend working, the employer can pursue a variation to the contract. Possible routes would be to make a case for a 'substantial reason' for fundamental change to the contractual requirement based on 'sound and good business reasons'. Such reasons may include improved patient access, experience and safety, more effective use of high value equipment and underpinning changed working practices elsewhere in the organisation, e.g. a new acute medical unit, acute oncology service, enhanced weekend trauma service. The employer has to demonstrate good evidence for the 'sound and good business reason', show that the advantage of the change has been carefully balanced against detriment to the employees and involve the relevant Trade Union. If a fair procedure is followed along the lines of the Advisory, Conciliation and Arbitration Service (ACAS) Code of Practice with necessary consultation, information disseminated, representation invited and notice given, then 'fundamental change' can be legally supported. The employer would have to ensure that the contractual change did not discriminate directly or indirectly.

Staff Safety

119. Consideration should be given to the safety of staff working extended days and weekends. When planning the introduction of 7 day working, teams should look carefully at staff safety in general environmental terms as well as that specifically related to the actual work. Some areas of imaging have been associated with work-related musculo-skeletal disorders through repetitive movements (ultrasound and mammography) or lifting heavy pieces of equipment (MRI coils). Imaging services are often split up and have different areas of imaging in different parts of the hospital, many of which are not usually open outside of core hours. When planning service change, it would be sensible to consider co-locating services where possible.

Proposed Changes to Healthcare Workforce

120. With the support of the Secretary of State for Health, Medical Education England (MEE) has established the Better Training Better Care (BTBC) programme to implement the recommendations from two reviews of postgraduate medical training: *Time for Training* and *Foundation for Excellence* [32]. *Time for Training* looked at the impact of the Working Time Directive on the quality of postgraduate medical training. It concluded that high quality training can be delivered in reduced hours but this is precluded when trainees have a major role in out of hours service, are poorly supervised and access to training is limited. It recommended that the traditional experiential model of learning had to change and that consultants needed to be more directly responsible for the delivery of care. *Foundation for Excellence* echoed this issue and noted that some foundation doctors feel that they are expected to practise beyond their level of competence, without adequate supervision.

121. There are obvious synergies between 7-day hospital and the BTBC programme. BTBC will be looking at appropriate supervision, service design to explicitly support training and making every moment count. As part of this work, MEE has identified a number of hospitals that are already developing good practice models. Other projects that form part of the programme include revision of the Foundation Programme Curriculum and delivery of the recommendations of the DH framework for technology enhanced learning.

Summary and Conclusions

122. This good practice guidance document has described how it is possible to move to 7 day working in imaging departments. Such a significant change in working practices will not, however, be without its challenges. Described here are those challenges and strategies for how they may be overcome. The issues discussed will be similar for all other health care services and there is much overlap as co-dependent services move to a more patient focused and efficient 7 day working environment.

123. This work will be used as part of the wider programme of work in the Department of Health to explore 7 day working across the healthcare sector. It should also form the basis of discussions within imaging departments and by those departments with commissioners of healthcare and other departments in secondary care. It should be used to assist as we make these changes and begin what maybe a significant journey of change for the provision of not only imaging services but the whole of healthcare.

Case Studies Describing the Move to 7 Day Working

The following case studies provide information which can be used to build a business proposal for moving from traditional five day working with on call to extended and 7 day working.

Study 1

Background: Following a strategic review of acute medical care it was decided to centralise all acute care previously provided on two sites into a new hospital to be built adjoining the current hospital site. In the interim, a free standing 120 bedded Acute Admissions Unit (AAU) with integrated diagnostic imaging (x-ray, CT, ultrasound and reporting facilities) was developed. The service delivery model was based on reducing patient stays and allowing fewer acute care beds.

Service Delivery Model: In order to achieve the necessary reduction in stay a model of intensive consultant-led care was developed. Consultant level ward rounds are held at least daily on a 365 day basis, supported by extended day working in clinical support and therapy areas.

Radiology Model: Activity mapping prior to the changes suggested that all emergency and in-patient (excluding complex interventional) investigations equated to approximately 20 hours of radiologist time. The imaging department agreed to provide a radiologist on-site between 08.00 and 20.00 Monday to Friday and 09.00-13.00 on weekends and bank holidays[2], supported by radiographers and radiographic helpers. The AAU radiologists are responsible for all in-patient investigations and simple interventions (drainages, biopsies etc.).

Radiologist Rotas: These are multiple. Essentially radiologists spend approximately one week in four in AAU either as AAU1 (8-4) or AAU2 (10-6). There are further evening, weekend and bank holiday rotas as well as a traditional out of hours on call rota. When not in AAU, the radiologist performs traditional type work, although not with traditional lists, other than if undertaking hands-on examinations. Most work is distributed on an individual basis by a computer programme on to work lists, based on available reporting time. This system allows flexibility in the provision of backfill when the scheduled AAU radiologist is not available.

Additional Resources: The AAU business case included funding for two additional radiologist posts and three radiographer posts. The helper post and secretarial support were not funded. Portering was funded separately. The service was housed within a purpose designed radiology department within the AAU. New radiology equipment was approved as above. Centralisation of services, together with lack of capacity, also required development of an on site MRI service.

[2] this was constrained by financial and other staffing considerations

Outcome: Average length of stay has reduced by approximately two days. CT and ultrasound examinations are usually performed within one to two hours of a request being received. Patients can have additional imaging easily (e.g. from ultrasound to CT). Consequently diagnostic decisions can be made very early in the care pathway. Increased activity is in-line with historical growth. Four hours of weekend radiologist provision, although not ideal, has proven workable as there will be a session the following day. Examinations not required for immediate patient management can be delayed, with certainty that there will be capacity on the Monday.

Study 2

A whole hospital review was established to try and address the problem of cancelled elective admissions because of poor control of emergency admissions. Several changes were implemented but it was felt that better access to radiology for in-patient and emergency work was required at weekends.

'7 Day Radiology' was implemented and there is now a consultant radiologist performing routine work in the department on a Saturday and Sunday from 9am to 5pm. This radiologist:

- reports all in-patient and A&E plain x-ray film work;
- performs an in-patient ultrasound list on Saturday mornings to clear the backlog from the week and Friday night admissions;
- covers any urgent or emergency CT and ultrasound work over the weekend;
- supervises and reports out-patient CT scans performed over the weekend. The CT lists are booked at approximately 50% of the weekday rate to allow for emergencies and the other work that the radiologist is doing.

Additional staff to run this service includes two radiographers and an additional porter on a Saturday morning.

The service has been running for over 10 years and remains extremely popular with the referring clinicians. As this was not an isolated change to working practice it has been difficult to prove the impact of the changes in radiology alone, but it has been part of an overall significant improvement in reduction in length of stay and reduction in admission rate for the emergency stream.

The usual Friday afternoon and Monday morning pressure points for CT and ultrasound have been removed.

Study 3

This case study describes a two stage strategy to provide a gold standard level of care to:

- meet national guidelines ensure patients admitted on a Friday or weekend day are not disadvantaged in terms of investigation;
- ensure the service is delivered safely and to ensure the work/life balance of staff is maintained;
- deliver training in emergency medicine where appropriate;
- ensure appropriate use of ancillary staff to deliver a safe and efficient service.

We would anticipate this change happening over six months.

Stage 1

To provide this we need:

a) 1 PA radiologist time Saturday mornings;
b) 1 PA radiologist time Sunday mornings;
c) 0.25 wte radiographer time;
d) 1 dedicated porter;
e) Outside staff for days when there is no trainee on call to cover calls between 11pm and 7am.

Stage 2

To fully meet the aims above we need:

a) 3 sessions 9am to 6pm radiologist time Saturday and Sunday;
b) 2 radiographers 9am to 5pm both days;
c) 2 porters all day;
d) 1 sonographer each day;
e) 1 secretary/typist until voice recognition is established;
f) Outside staff for days when there is no trainee on call to cover calls between 11pm and 7am.
   Ultimately, when fully staffed we would hope to repatriate the outsourced calls to the departmental radiologists within an appropriate job plan.

Advantages

- It is the care we would want for our families;
- Rapid diagnosis and treatment of patients;
- Reduced morbidity and complications;
- Better utilisation of beds;
- Shorter average length of stay;
- No bolus of Monday morning requests impacting on later week;
- Patients treated safely by rested, less stressed staff;
- Better work/life balance for all staff;
- EWTD compliance;
- Better imaging support for other departments.

Disadvantages

- Increased costs, but some of these will be offset by the benefits;
- Employ extra radiologists;
- Employ and train extra radiographers;
- Break from traditional ways of working;
- Need for flexibility.

Study 4

The Directorate introduced a new 7 day service model in July 2010, a model which supports reducing average length of stay and delayed discharges. It also supports the achievement of cost improvement targets.

The service change included:

- The introduction of contractual, routine extended working 8am to 8pm Monday to Friday and Saturday, Sunday and Bank Holidays 8am to 4pm for x-ray, CT, MRI and ultrasound (8am to 6pm) . Enabling out-patients to attend at more convenient times (before of after work for example) and the provision of additional and dedicated slots for cancer patients.
- Radiologists being available and on site 8am to 8pm Monday to Sunday, supporting appropriate discharge of patients especially at weekends and bank holidays.
- The first phase, extended MRI service was launched in April 2009 in support of the stroke team. The second phase commenced in April 2010 and the third phase July 2010.
- Reducing six week diagnostic breaches from a peak of three hundred and thirty six 18 months ago to zero in May 2010 and maintaining infrequent six week diagnostic breaches thereafter.
- Reducing waiting times from in excess of eight weeks to new directorate service standard of four weeks.

The change was supported by investment in:

- Two state of the art CT scanners which mean, for example:
  - patients receiving reduced radiation exposure;
  - avoidance of the use of sedation for young children / babies;
  - improved service productivity;
- Electronic reporting for GPs across the area. This model is being rolled out further a field;
- New imaging department peripheral sites – a new department, with modern digital equipment;
- Business cycle recruitment with more radiographers being recruited in February each year in advance of becoming qualified in August.

The need for change was identified, implemented and embedded through:

Business Planning

The 2009/10 Business plan described key changes which addressed the exponential growth in diagnostic demand. A series of 21 objectives were developed which were underpinned by detailed action plans. Each of these was led by a member of the Directorate Board.

All objectives were cascaded into individual staff appraisals. The directorate achieved a 97% appraisal rate in 2009/10, the highest level in the NHS Trust.

Extended working capacity and demand study
Demand and Capacity work was undertaken with time and motion cards being (willingly) completed by staff and compared to activity, captured by the radiology information system in each of the service areas. This highlighted times/days of oversupply. This model has been showcased at two national conferences.

Consultation on changes (informed by the demand and capacity model) took place with staff during November – December 2009.

Obstacles and remedies:
Understandably, individual staff concerns were expressed regarding pay and conditions where most staff would experience a 15 -20 % reduction of earnings at the end of pay protection. This led to the threat of industrial action as the scale of change was large and progressive. The dispute was resolved by listening to staff and compromising on areas which did not undermine:

- the timescale for the new service being introduced – all milestones were achieved on time;
- the quality of service offered – opening hours remained unchanged, though with some phasing to take account of training needs and staff concerns;
- the cost savings committed to as part of business planning and budget sign off – these have been praised by KPMG.

Staff forum and implementation teams were developed
(One each for medical staff, radiographers, nurses, breast unit and clerical staff) to facilitate staff engagement and communication.

Work included the development and application of Agenda for Change annex T for radiographers. In order to move from Band 5 to Band 6 under this agreement, radiographers should demonstrate that they have developed in the two years since qualification to the point that the job they are now doing is equivalent to a Band 6 job. Band 5 competency development was linked to preceptorship, KSF and annex T, meaning that staff are upgraded to Band 6 following successful assessment, linked to personal development and not budget or establishment; a key tool to improve retention and recruitment.

Breaches
A bi-weekly accountability and monitoring forum was developed and has input from clerical, medical and technical staff and the PCT lead commissioner for diagnostics. Evidence of the reduction in breaches are shown in Figure 2.

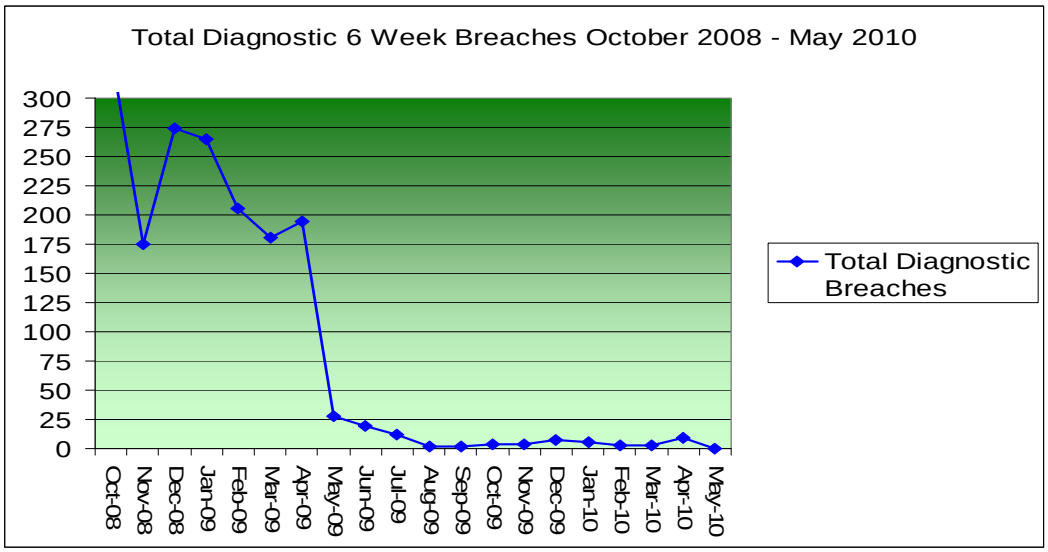


Figure 2

Evidence of clinical leadership, including influencing others:

- Clinical Director met with key stakeholder directorates and Clinical Management Board;
- Enlisted the support of the Medical Director to agree changes with the BMA;
- Enlisted the support of HR and Corporate Affairs Director in agreeing changes with Society of Radiographers (SoR) thus enabling the development of the new service model;
- Senior radiologists demonstrated progressive leadership in developing 7 day 8am to 8pm innovative working and enlisting support of BMA and other consultants;
- Presentation to national conference, March 2010 helping other NHS Trusts to learn from/copy the innovative service model.

Evidence of increased activity is shown below:

Activity 2007-08	479,389
Activity 2008-09	520,173
% increase between 07/07 and 08/09	8.5%
Predicted activity 2009-10	554,496
Predicted change between 08/09 and 09/10	6.6%

Study 5
Example of 7 Day Working Outside of Imaging Departments

Workforce changes for 7 day working

The main aim of our project was to have a funded 7 day service and not just a 5 day service spread over seven days. A project team was set up with a mix of clinicians, managers, HR etc and they worked together to come up with options. It took us a year to plan and has now been running for nearly two years.

All staff were involved from the outset and informed of the possible changes and the reasons for this major service change. The plan was for staff to continue to work 37.5 hours per week and if staff worked a weekend they would receive two days off the following week and work a maximum one in six weekends. Staff would receive the relevant enhancements for working weekends. Not all staff wanted to work weekends initially and we had to listen to their concerns and make other arrangements e.g. for childcare/religious beliefs. Now, as 7 day working has become established practise and staff can see the benefits, this is firmly embedded in our service. As new staff join the team our current working arrangements are seen as the norm.

Over the last year we have used skill mix changes and changed some posts to improve our capacity over 7 days. For example, staff wishing to return to work part time after maternity leave are offered contracts involving some weekend working. This can be a saving in childcare costs so is an attractive option to some staff members.

Our most experienced Band 5 staff act in a ‘floater’ role and cover the gaps left when staff have their two days off. This is seen as a good career development opportunity, as they need to be flexible, demonstrate effective time management and clinical skills in all areas. We have employed more Band 2 assistants. The use of Band 2 staff at the weekend is beneficial to continue with rehabilitation programmes once patients are assessed by qualified staff.

Our NHS Trust committed additional resources to implement the project and we had funding from the North East Cardiovascular Network specifically for stroke services. These monies paid for additional qualified and unqualified staff.

The project has been audited pre and post implementation and changes have been made along the way. We have reduced the number of patients prioritised out at the weekends and can demonstrate reduction in length of stay, as well as improved staff and patient satisfaction.

The project has been a success but we have further work to do to increase staffing levels at the weekend to match those of the weekday service. We also intend to rollout the service to include occupational therapy.

Study 6

South London Collaborative Working Pilot

1. QIPP project proposed by National PACS Programme Board:

a) Started from the assumption that significant productivity and quality benefits can be released if several diagnostic imaging departments pool their resources and workflows rather than working separately with varying degrees of duplication and inevitable challenges matching capacity and demand.
b) Representatives from diagnostic imaging departments of all NHS Acute Trusts in South Thames met for 2 workshops.
c) Initial discussion structured to capture the following broad areas of interest.

Baseline Situation:

- Current working patterns, Plain x-ray reporting, CT/MRI; Intervention;
- Prioritisation, GP/OP/IP/A&E;
- Current resources, consultant numbers, juniors, skill mix/radiographer reporting;
- Teaching/research;
- Outsourcing, Medica, InHealth, other;
- Informatics, PACS and RIS estate, Image and report transfer, eg. CD, IEP, PACS Exchange, other.

Incentives for greater collaborative/extended/out-of-hours working:

- Quality; patient, referrer, commissioner, DH/RCR/accreditation accreditation bodies;
- Cost;
- Job satisfaction, work-life, specialisation/sub-specialisation;
- Teaching/research.

Challenges:

- Organisational/ Political;
- Technological;
- Information Governance;
- Financial/Incentivisation;
- Sustainability.

2. Subsequent discussion focussed on key drivers:

a) What does the Independent Sector do that competes with us?
b) How do we cope if performance targets are used to get better outcomes for patients by offering choice of another ‘qualified provider’?
c) What would it mean for me/my team’s life and how could I make it better?

3. Possible solutions:

a) Group of DGH, plus tertiary centre 7/7 specialty overnight/weekend service for imaging in:

   i. Neuro/Stroke;
   ii. Body/Chest;
   iii. MSK/Trauma (Trauma Centre).
b) Explore how group could work for:
   i. Peer review/double report/audit;
   ii. Smoothing demand/capacity and improving turnaround.
c) Collaborative 'hot reporting'; pooling simple workload:
   i. GP reporting;
   ii. A&E films.

4. Main points arising from the discussion:

a) DI departments experience increasing difficulty delivering a timely high quality service;
b) Waiting times starting to rise. Few departments meeting DH recommendations for urgent, IP and GP reporting turnaround;
c) Very little double reporting/quality audit of NHS work except for MDT review (mainly limited to cancer);
d) Current workforce model means that provision of extended (Out of Hours) working requires DI professionals to maintain a broad range of skills/competencies;
e) Interface with other clinicians, especially junior doctors, who appear increasingly dependent on DI resources, and MDT commitments act as perceived distractions from core 'productivity';
f) Rising demand especially for complex DI e.g. CT and MRI coupled with financial restrictions enhance the gap between demand and current capacity;
g) Larger teaching institutions felt more able to live within their means due to culture of subspecialisation, underpinned by an adequate source of junior radiologists;
h) There is considerable concern from NHS providers that any use of the independent sector (IS) could highlight relative cost effectiveness and quality of the IS and prompt commissioners to consider how a more diverse supplier base could improve services and achieve QIPP gains;
i) Getting the existing technology to work e.g. IEP, Accenture PACS connect might be a challenge. Trepidation about asking IS to help with their successful technology;
j) Contractual drivers and reimbursement (element of 'fee per item') would be of central importance. Shift of contractual relationship to a collaborative group, or even a formal diagnostic imaging network similar to that mooted for pathology services, may become necessary;
k) Information Governance was likely to be a challenge and a collaborative approach involving all Caldicott Guardians should be pursued.

5. Propositions that were more hotly debated included:

a) Running separate 'On Call' rotas acts as a significant blocker to increasing radiologist subspecialisation and the quality, productivity and workflow benefits that could be released if more complex/high end DI were delivered by subspecialists;

b) Radiology quality of life could be positively impacted by wider subspecialisation with consequent confidence and productivity benefits;
c) Impact of private practice as a driver for change was complex;
d) This is likely to become more of an issue with more radiologists focussing on subspecialty development in the latter part of training;
e) Perceived objections to change arising from local relationships with clinicians and professional trust between clinicians and 'their' radiologists, while real and significant, can be addressed by familiarity with a wider clinician radiology network that supports the normal channels of mutual support and interaction. There is some evidence for this from some of the IS provision experience as well as from regional MDTs.

6. Next Steps:

a) Review state of initiative in light of establishment of DH Extended Working DI Reference Group;
b) Design a pilot along the lines of 3a), above;
c) Discuss detail workflow with potential technology partners inc IEP, APC and PACS Exchange.

Study 7

Pilot Project: CT Inpatient Scanning Trial at City and Queens Medical Centre (QMC) Campuses

Introduction

Currently, the inpatient CT service operates between 9am-5pm Monday to Friday at both QMC and City hospitals. All referrals are requested electronically, vetted according to protocols by radiologists, scanned by radiographers and reported by radiologists (on the day reporting). Referrals outside these hours can be discussed with the radiology SpR and will be completed, if assessed as urgent. As a result, routine referrals after 5pm on Friday will not be scanned until Monday morning at the earliest. In 2010 83% of inpatients were scanned within 24hrs of referral. These trials will assess the most efficient weekend service model to reduce inpatient waits across both City and QMC which will then support the department in completing a 'Case of Need' for full implementation.

Objectives

- To reduce waiting time for routine Inpatient scans at weekends;
- Increase the number of weekend discharges across Nottingham University Hospitals (NUH);
- Reduce length of stay;
- Improve patient experience;
- Increase staff satisfaction;
- Understand the impact of weekend scanning on the in week demand;
- Achieve 100% of CT imaging performed within 24 hours.

Method

Complete three trials of increasing CT inpatient capacity across the weekend / Mondays:

Trial one (2 weeks)

- Saturday 4hrs and Sunday 4hrs at QMC and Sunday 4hrs at City Consultant led CT service. Total cost of two weeks = £6781.

Trial Two (2 weeks)

- Sunday only work at both QMC and City 4hrs. Total cost of two weeks = £3391.

Trial Three (2 weeks)

- Increase inpatient throughput on a Monday by extending the working day 8am-6pm City. Total cost of two weeks = £1749.

Benefits

- Reduce the number of outstanding referrals on Mondays (2010 average of 13);
- All of the patients referred will be scanned within 24hrs (2010 performance of 83%);
- Potential bed day reduction of 4,824 (number of bed days waiting more than 24 hours in 2010).

Next Steps

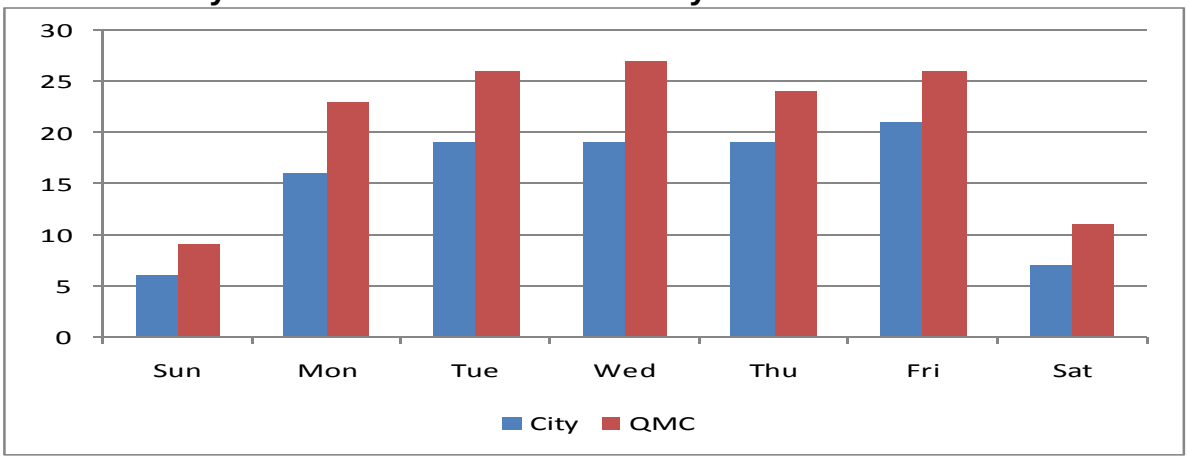
- Present findings to Internal Wait Steering group and Directorate CD/DCD;
- Agree funding for trials;
- Finalise methodology and baseline measures;
- Commence trial 1st April 2011;
- Write communication plan.

Baseline

Daily Demand for CT

- Currently 13 inpatients waiting on Mondays for their scan – Target zero;
- Need to reduce daily variation across the week.

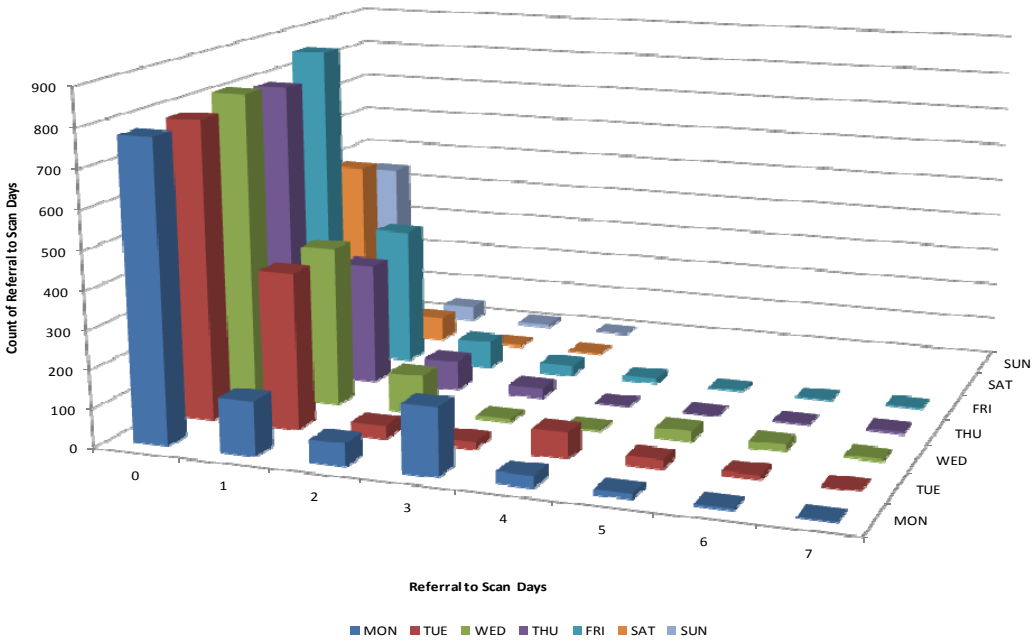
Graph to show daily demand to show different daily demand at different sites with NUH



No of Days waiting for CTs

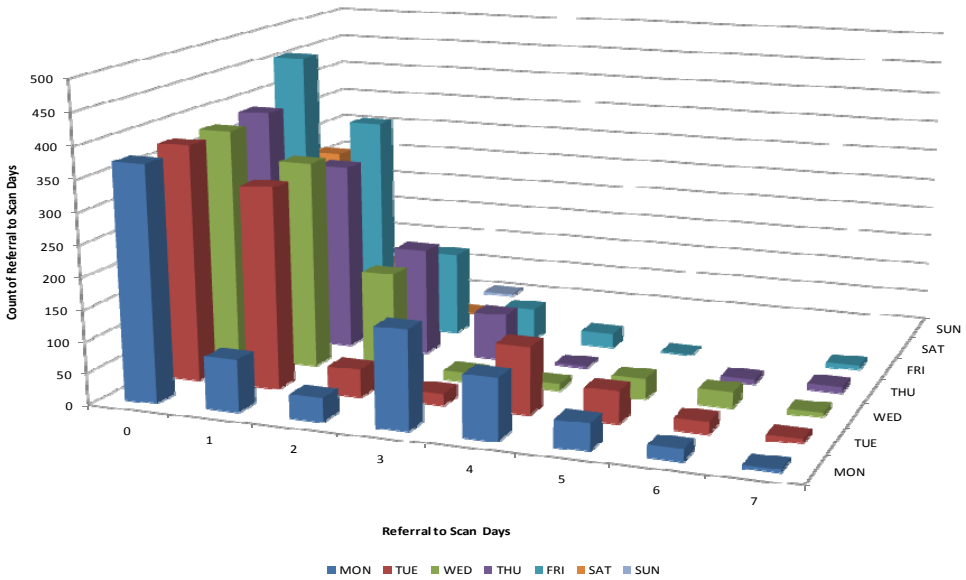
- 2010 - 83% of inpatient referrals scanned with 24hrs (target 100%);
- QMC CT inpatient waits: 4% of the patients scanned on Mondays have waited 4 or more days.

Graph to show CT waiting times for referral to scans at QMC



- City CT inpatients waits: 20% of patients scanned on a Monday have waited 4 or more days for their scan;
- 4,824 days were spent by inpatients waiting for their CT scans (Number of days between referral and scan 2010).

Graph to show CT waiting times for referral to scans at City Hospitals



Appendix A - Key Terminology in Informatics

Picture Archiving and Communication Systems (PACS) is the system of acquiring, storing and distributing images and reports where available in a digital form and so can be considered as a teleradiology system, although its primary aim is usually to share images within an organisation, rather than between organisations and locations. By 2008, Connecting for Health (CfH) had successfully implemented PACS in all hospitals in England.

Radiology departments store their information on **Radiology Information Systems** (RIS). A RIS is a commercially available product that varies from manufacturer to manufacturer but the core functions are to process requests, schedule exams and generate reports, as well as capture information on procedures performed and interpreted in the radiology department. There is work ongoing to address how current radiology information systems (RIS) can align to allow inter NHS Trust collaboration.

Teleradiology is the transmission of images and associated data between locations for the purpose of primary interpretation or consultation and/or clinical review. Such a process involves the sharing of patient identifiable information within and between organisations and potentially across international boundaries. Where reports are available, images should no longer be transferred without them. Teleradiology has the potential to use image reporting and interpretation skills differently and across wide geographical areas.

Ordercomms is a web based method of requesting imaging investigations *and* getting back the results.

A **Patient Administration System** (PAS system) is vital to the effective operation and management of hospitals. It enables the hospital to record activity, monitor throughput against contracts and report to its service commissioners and performance against key targets.

Appendix B - Image Viewing: 'Diagnostic vs. Review'

Formal interpretation of diagnostic images, mainly but not uniquely carried out by radiologists, is almost entirely performed using PACS workstations and high resolution 'medical grade' monitors which are provided as part of the CfH contracts and subject to quality assurance and service management commitments under those contracts.

Viewing of images across NHS Trusts is predominantly via a PACS Web browser and images can be viewed on a wide variety of computer screens of varying size and quality.

Extensive guidance has been issued on how to ensure that diagnostic images are viewed in such a way as to minimise the risk of missing significant findings. *(NPFIT-PAC-DES-004206 Guidance for Quality Assurance of PACS Diagnostic Display Devices v1 0. See document for embedded evidence.)*

Suppliers of PACS systems typically distinguish between viewing systems for primary diagnosis, typically high end PACS workstations combined with high quality monitors, and those for image review, typically Web viewing on 'ordinary' NHS Trust PC monitors.

The reality is that 'primary' interpretation is often carried out under 'review' conditions, typically in wards, emergency departments and intensive care units where, in an acute in-patient setting a formal radiology report, generated under 'diagnostic' viewing conditions, may not be available.

Subject to adequate monitor configuration, optimal lighting conditions and careful use of image viewing tools within the Web browser there is no reason why clinical decisions cannot be safely made using Web access. However, it is very difficult in practice to assure uniformly optimal viewing conditions and optimally specified and configured monitors across all locations where diagnostic images may be viewed. Recent alerts from the National Patient Safety Agency (NPSA) on the confident detection of accurately placed nasogastric tubes is one reason among many for ensuring that such studies are viewed in a safe way.

The main factors that need to be taken into consideration and the steps that can be taken to maximise the safe use of PACS across the healthcare setting are set out below.

1. LCD Luminance Range

Commercial off the shelf (COTS) displays will inevitably have a lower maximum luminance than a medical grade monitor, which reduces the contrast that can be displayed. In conditions where the lighting is too high, the dynamic range available would be compressed further, leaving only a small range of luminance available to view the contrast in the images. How important this is depends on the application and the extent that window width/level tools can be/are used. For an inherently high contrast modality where window width/level tools are

routinely used such as CT, a smaller dynamic range is usually adequate. For chest radiographs a reduced dynamic range can significantly compromise clinically relevant contrast which could be important in, for example, accurate detection of nasogastric feeding tubes. Therefore, in order to safely review these types of images, a higher luminance display is important.

Laptop displays are usually set to vary the luminance depending on the ambient lighting and the power saving regime employed. This will of course make any limitations of a COTS display even worse.

Careful selection of a COTS monitors is essential to ensure an adequate luminance range. Laptops pose more of a challenge, and a special power saving mode would have to be configured to ensure maximum luminance and no dimming.

2. Bit Depth

Monochrome image pixel data can be between 8 and 16 bits deep. It is therefore necessary to ensure that the colour space of the computer and graphics card is using enough bit depth to enable an adequate number of grey levels to be displayed simultaneously. For a colour system, 24 or 32 bit colour without any reserved colours is required in order to display 8 bit grey. Any less, and the image display would be seriously compromised.

3. Resolution

For low resolution modalities, such as CT, MR and ultrasound most COTS monitors offer perfectly adequate spatial resolution. With plain radiography, viewing at 'fit to screen' will result in small details disappearing and artefacts of the interpolation appearing. Judicious use of the zoom and panning tools can overcome this, at the expense of time, and the ability to compare features on different areas of the image. Continuous education and the intermittent use of check software are necessary to ensure no gradual drop in performance.

4. Noise

The higher quality of the medical grade displays is supposed to reduce the noise introduced to the image from the display. For example, low frequency noise introduced by the uneven diffusion of the back lights will make comparing regions of the image difficult, and high frequency noise in the individual variations in response of the pixels and sub-pixels will introduce structure into the image that should not be there.

5. Calibration

Some medical grade monitors self calibrate to DICOM GSDF, and all are calibrate-able and their calibration can be checked. COTS monitors can also be calibrated, but this usually will require extra software to manipulate the graphics card gamma curve. If this is not done, then the contrast visible in parts of the luminance range will generally be much reduced, particularly in the darker areas.

6. Environmental Conditions

In a hospital, it is a continuous challenge to ensure that images are reviewed in suitably low lighting conditions. Without low contrast test cards to prove the point, it can be difficult to persuade people that it is necessary. Outside hospital e.g. in community settings this is even more of a challenge, particularly if a laptop is being used.

7. Ageing

COTS displays are said to deteriorate quicker than medical grade monitors. The main aspect of this is that with a COTS monitor the peak luminance will drop relatively quickly. The maximum luminance of a medical grade monitor will drop in a similar fashion, but the display will be set to use a peak luminance that is lower than the maximum such that after a reasonable working lifetime the maximum possible brightness remains above the configured peak luminance. The peak luminance of a COTS monitor might be able to be restored by use of the brightness controls on the monitor, but a display in the home is unlikely to be monitored so as to notice. This would then reduce the contrast across the range without the user necessarily knowing they are seeing less contrast for the same difference in grey level. Laptops should be checked on a regular basis and a standard monitor should be checked for maximum luminance either by transporting to the hospital or measuring it in situ if resources allow.

8. Viewing Angle

Different technologies behind the different types of Liquid Crystal Display (LCD) displays can have dramatically different viewing angles. On a standard COTS monitor, as you move away from viewing the display absolutely perpendicularly the contrast reduces quite quickly. On a laptop monitor, this typically is even worse. On a medical display, this is usually much better, therefore reducing the risk of not seeing information in an image simply due to the angle of your vision to that part of the display.

9. Teleradiology Technology

Solutions vary on the delivery of image data to the reviewing radiologist. Some deliver the full dataset of DICOM images to the end user to be displayed using local software. The more popular solutions either use a virtual private network (VPN) and the standard web PACS, or use a thin client service where image manipulation is performed in the data centre and the radiologist sees a streamed picture of that desktop.

When using the standard Web PACS viewer over a VPN, providing the Web PACS is setup to display the images correctly at the hospital, no further degradation should take place by virtue of being remote.

When using thin client (e.g. Citrix) service, careful configuration is necessary. There is more potential scope for image degradation e.g. bit depth (fewer grey levels) and resolution. The images will also be compressed which can be 'lossy' or 'lossless'.

A robust way of minimising the risk of inappropriate use of PACS viewing under suboptimal conditions is the use of a Quality Assurance test device. Such devices typically present the user of the image viewing system with a test screen at the point of logging on to the system. This screen tests the visibility of contrast and spatial resolution and may be combined with a formal test (identifying letters for example) to verify that the test has been passed. The test device may alert the user to any apparent suboptimal performance and may log any decision by the user to proceed despite 'failing' the test. A variety of such test devices are available.

Verified LogIn (Rothband Ltd) is one such device based on a patent held by the Medical Physics team at Leeds Teaching Hospitals NHS Trust. Another device is incorporated into the North West SHA PACS Portal which is also available to the rest of the NHS.

Appendix C - NHS Atlas of Variation in Healthcare

Some variation in commissioning, in terms of activity and expenditure is inevitable and appropriate to reflect clinical practice, local circumstances and need. However, some variation is due to services being inaccurately commissioned according to the specific clinical needs of their local patients, where services are under-utilised or overburdened. Such unwarranted variation suggests there are opportunities for commissioners to gain better value from their use of resources.

The NHS Atlas of Variation in Healthcare presents a series of maps of topics which National Clinical Directors from the Department of Health and others have identified as important clinical areas which show significant levels of potentially unwarranted variation. Addressing the appropriateness of services is vital for the optimal healthcare of patients and populations irrespective of the existence of financial constraints. The NHS Atlas of Variation looks at variations in outcomes, spend and activity across local areas, with the intention of focusing the attention of clinicians, commissioners, local health economies and populations on the appropriateness of local activity, expenditure, quality, outcome and value. Through stimulating the NHS to search for unwarranted variation and, by extension, to tackle the causes and drivers of that variation the Atlas will help ensure consideration of improving value is firmly on the health agenda in the future.

Variation in the level of quality is likely to persist as services seek to improve. This variation is understandable and explicable, especially as each service strives to reach the level achieved by the best, while the best themselves will have moved on.

The two areas of imaging services currently mapped are for Magnetic Resonance Imaging (MRI) and Computer Axial Tomography (CT) but consideration is being given to describing a broader range of imaging, and other interventions/diagnostics in future editions.

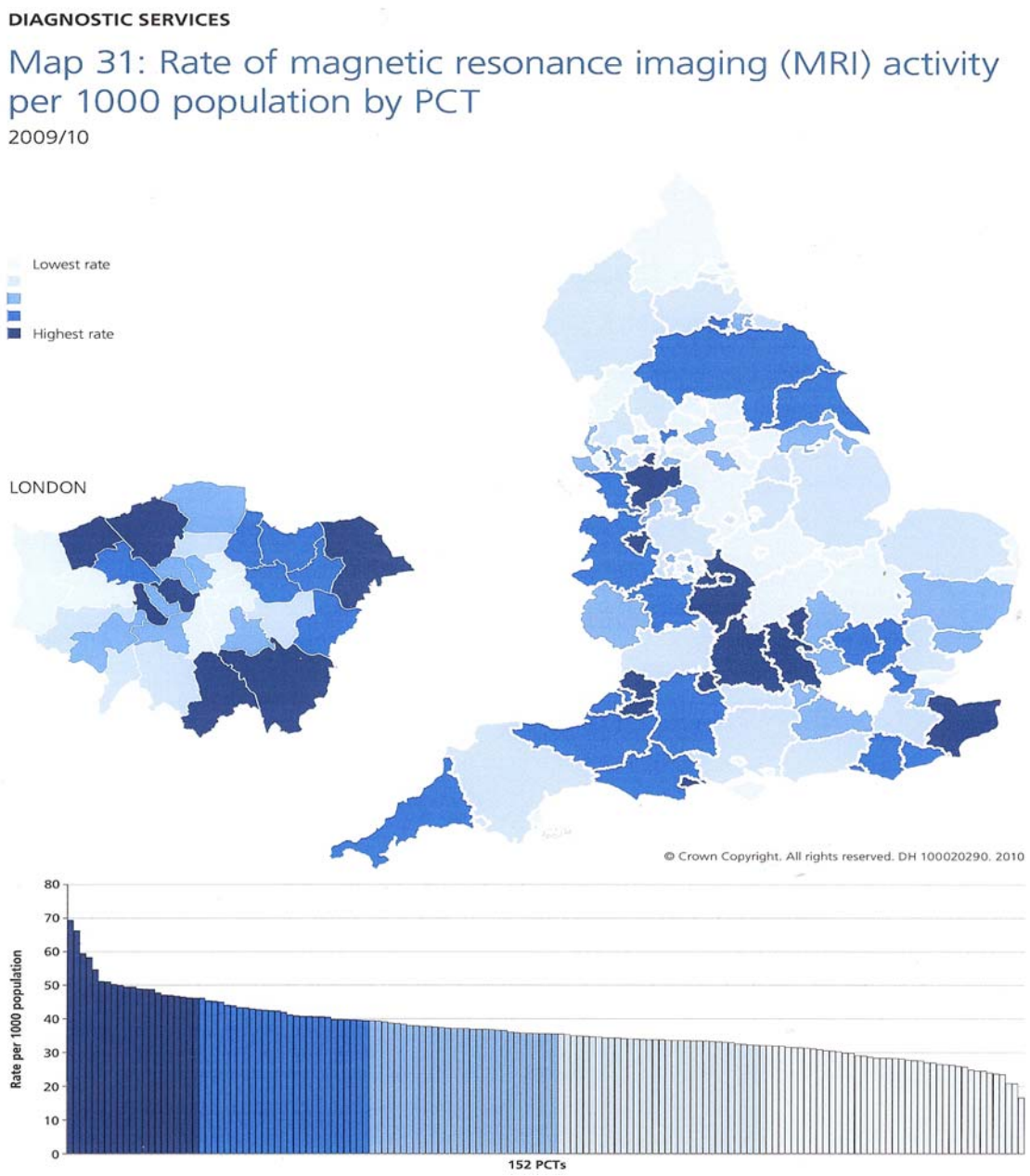


Figure 6

There is a fourfold variation among PCTs in the rate of MRI activity per 1000 population. When the five PCTs with the highest rates and the five PCTs with the lowest rates are excluded, the variation is twofold

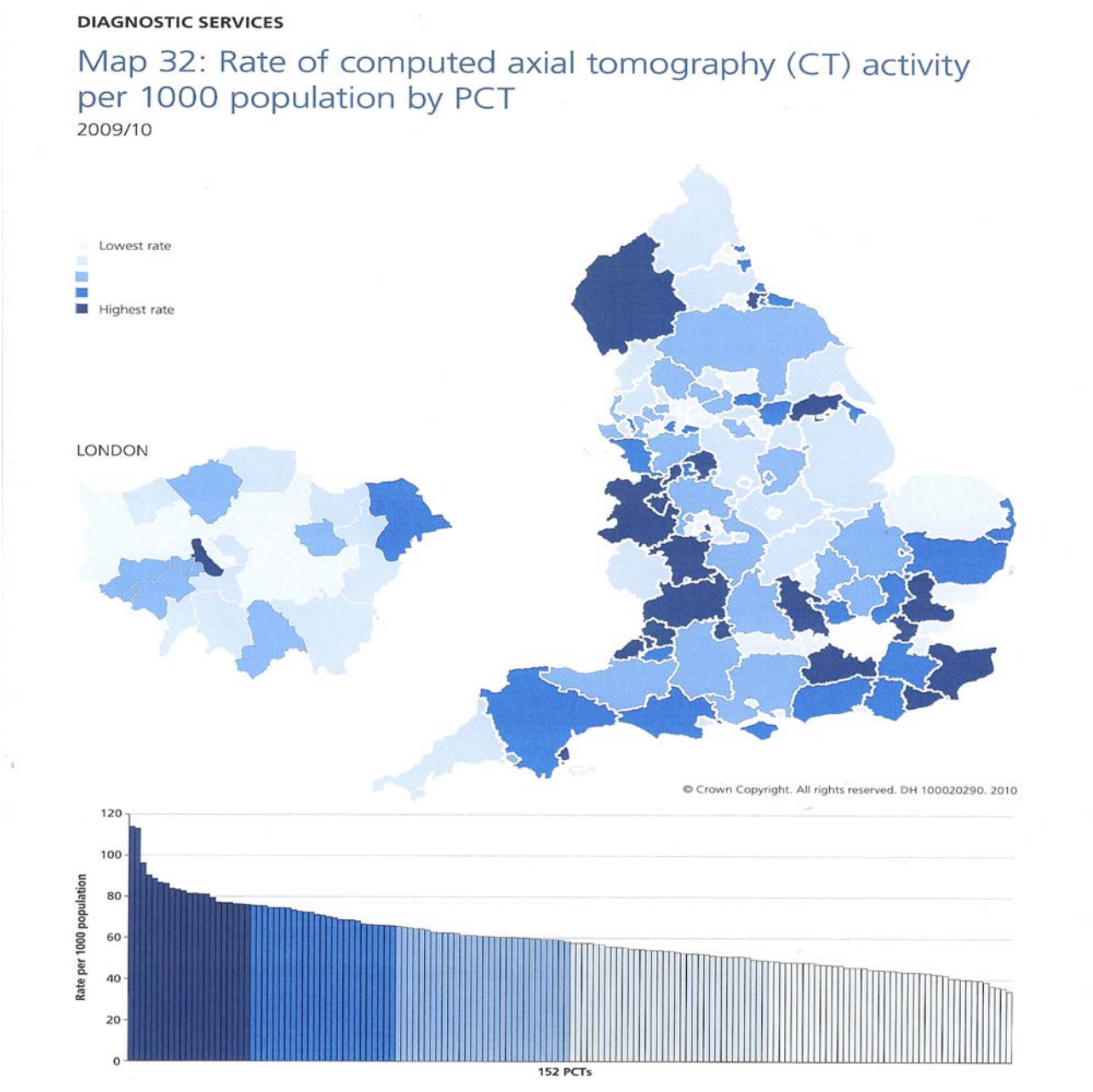


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Figure 7

The variation among PCTs in the rate of CT activity per 1000 population is threefold. When the five PCTs with the highest rates and the five PCTs with the lowest rates are excluded, the variation is greater than twofold.

Although some of this variation can be attributed to the availability of both equipment and workforce, much of the variation could be due to local clinical practices that have evolved over time, which may need re-assessing.

From the patient's perspective, it is important to reduce any unwarranted variation, especially in CT activity, because unlike MRI this intervention carries a heavy radiation burden, which is to be avoided whenever possible because of the potential harm it could inflict.

Although this is less of an issue in England, partly due to the leadership of the Royal College of Radiologists, whole-body screening is being promoted by private providers, which is of little benefit to the individuals concerned while increasing the level of radiation to which they are exposed, and generating referrals to the NHS.

To address any unwarranted variation, it is important to concentrate on applying evidence-based practice at a local level. This can be achieved by using evidence-based patient pathways for diagnostics, and the right diagnostic techniques. Variation in service provision may also be reduced by changing to extended and 7 day working.

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