

Radiology review

A national review of radiology reporting
within the NHS in England

July 2018

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Foreword

It is widely recognised that the demand on health and social care services is increasing year-on-year. This is putting pressure on all areas of the system including radiology services, which play a key role in the diagnosis and management of many different of conditions.

In 2017, we uncovered serious concerns around the length of time it was taking for Worcester Royal Hospital, Kettering General Hospital and Queen Alexandra Hospital to report on radiology examinations, and the potential risk to patients that this posed. The issues found at these trusts warranted immediate action, but it flagged wider concerns about delays in reporting across NHS trusts.

Following these inspections, we have strengthened our approach to assessing radiology services. This includes introducing new key lines of enquiry to help inspectors monitor the reporting of imaging examinations to make sure that radiology services are providing a safe, effective, caring, responsive and well-led service for patients.

However, the issues flagged in our report highlight that there has been a lack of recognition and management of the risk these present. There is a need for wider local and national action to address current delays and to keep people safe from harm. In particular, the lack of clear national standards for trusts to benchmark themselves against is a key barrier to ensuring that radiology examinations are both reported on in a timely manner, and making sure that trusts are effectively monitoring the performance of radiology services.

Ongoing issues with the recruitment and retention of radiologists is another area of concern that has had a negative effect on the timeliness of reporting. While this is a national issue, trusts need to make sure that they are using the staff they have as effectively as possible to address any gaps, including recognising the skills of reporting radiographers. Trusts should also be able to assure themselves that any reporting that is outsourced or delegated to non-radiology clinical staff is being reviewed by clinicians who are appropriately trained and competent to perform the task. The safety of any such approach must be closely assessed and monitored.

Our report calls for action to address these issues, which have gone under the radar for far too long. Action needs to be taken now to help minimise the risks to patients and make sure that patient examinations are reported on in a timely way by an appropriately trained healthcare professional.

Professor Ted Baker
Chief Inspector of Hospitals

Summary

Radiology* is a key service that plays an essential role in diagnosing and monitoring a range of diseases and conditions from broken bones, to blood clots and gastrointestinal conditions. Over the last five years, the use of radiology has grown more than 16%, with more than 42 million examinations carried out on NHS patients in England in 2016/17. With technological advances and an aging population, this demand is likely to continue to increase year-on-year.

Between July 2016 and July 2017, we uncovered serious concerns around the reporting of radiology examinations in the radiology departments at Worcester Royal Hospital, Kettering General Hospital and the Queen Alexandra Hospital. At these trusts, we found serious problems with delays in reporting on radiology examinations, leading to a backlog in reporting, and images that had only been reported on by non-radiology clinicians who were not adequately trained to do so.

Following the problems uncovered on these inspections, we wanted to look in more depth at radiology reporting to understand the extent of the problem across NHS trusts in England. In November 2017, we sent an information request to the chief executives of all NHS acute (151) and community (19) trusts and asked them to tell us about the timeliness and governance of radiology reporting in their trusts between August 2017 and October 2017.

We found that there are few national standards for trusts to benchmark themselves against so trusts can be unclear about what good looks like. In particular, we found huge variation in reporting times and how trusts monitored these. Having a defined set of key performance indicators (KPIs) allows trusts to monitor reporting times effectively, to know when to escalate backlogs to senior management, and helps to drive improvements in the service. However, whether trusts had KPIs in place, what these measured and how frequently, as well as how concerns were escalated, varied across trusts.

Even trusts that we found were routinely monitoring turnaround times and performance against KPIs, as well as monitoring and managing unreported images, were sometimes struggling to provide timely reports. This suggests that the problems we are seeing in reporting delays for radiology examinations cannot solely be addressed through improving governance and escalation processes in local trusts.

Issues with staffing were also found to be affecting reporting times as there are not enough radiologists to meet current demand. We found the average vacancy rate across all responding trusts was 14%. This supports evidence from the Royal College of Radiologists and NHS Benchmarking, which have shown ongoing issues with the recruitment and retention of radiologists. Radiographers who are trained to report on radiology examinations play a valuable role in reporting on radiology examinations in a timely manner and reducing reporting delays, but it is clear that the skills of reporting radiographers are not always recognised or they are not being given protected time to report on radiology exams.

* In this report we use the term radiology, which includes all imaging techniques, including those that do not use ionising radiation, for example ultrasound and magnetic resonance imaging (MRI).

The issues being faced by radiology do not have a single solution and involve both local and national action now. As part of our review, we have made a number of recommendations that are aimed at reducing the potential risks to patients caused by delays in reporting on radiology examinations and having inappropriately trained staff outside of radiology reporting some studies. CQC, NHS Improvement, NHS England, the Royal College of Radiologists and the Society and College of Radiographers all need to work together to action these recommendations.

Recommendations

1. NHS trust boards should ensure that:
 - they have effective oversight of any backlog of radiology reports
 - risks to patients are fully assessed and managed
 - staffing and other resources are used effectively to ensure examinations are reported in an appropriate timeframe.
2. The National Imaging Optimisation Delivery Board should advise on national standards for report turnaround times, so that trusts can monitor and benchmark their performance.
3. The Royal College of Radiologists and the Society and College of Radiographers should make sure that clear frameworks are developed to support trusts in managing turnaround times safely.

Introduction

Radiology is a key service that plays an essential role in diagnosing and monitoring a range of diseases and conditions from broken bones, to blood clots, and gastrointestinal conditions. Types of radiology examination include plain film X-rays, computed tomography (CT), ultrasound and magnetic resonance imaging (MRI).^{*} Over the last five years, the use of radiology has grown more than 16%, with more than 42 million examinations carried out on NHS patients in England in 2016/17.¹

Plain film X-rays make up the majority of activity carried out in radiology departments, with 22.9 million examinations carried out in 2016/17, an increase of 8% over the previous five years. More complex types of radiology examination, such as CT and MRI, have seen a larger increase with 44% and 43% respectively over the previous five years. However, these examinations are performed less frequently than plain film X-rays. For example, approximately 3.4 million MRI scans were performed in 2016/17, compared with 9.4 million ultrasound scans and 4.8 million CT scans. With technological advances and an aging population, this demand is likely to continue to increase year-on-year.

A radiologist is a doctor who is specially trained to interpret diagnostic images, while radiographers are registered healthcare professionals trained to perform a wide range of imaging. When a patient has a radiology examination, a radiologist or a radiographer who has undertaken training to report on radiology examinations, will usually report on the images. Some images may be reported on by a specialist doctor in other fields in medicine. The report will summarise their findings and make recommendations for treatment. This report is sent to the doctor who referred the patient for the examination, for them to discuss the results with the patient and act on any findings.

Depending on where the patient has been referred from and the type of examination, for example X-ray requests from outpatient clinics or the emergency department, images may be reviewed by the referring clinician before a formal report is written by radiology staff. However, the doctor who referred the patient will not usually have expert training in reviewing such images and will rely on an expert opinion, which the radiology report provides.

Between July 2016 and July 2017, we uncovered serious concerns around the reporting of radiology examinations in the radiology departments at Worcester Royal Hospital, Kettering General Hospital and the Queen Alexandra Hospital.^{2,3,4,5} At these trusts, we found serious problems with delays in reporting on radiology examinations, leading to a backlog in reporting, and images that had only been reported on by non-radiology clinicians who were not adequately trained to do so. We took enforcement action at these trusts as patients were being put at risk, with diagnoses having been missed and trusts not following expert guidance produced by the Royal College of Radiologists (RCR).⁶ Inspectors at one trust found there had been three serious incidents where patients with lung cancer had suffered significant harm because their chest X-rays had not been seen by radiologists.

Issues around delays in reporting and backlogs of unreported images have previously been highlighted in national reports, for example from the RCR and NHS Benchmarking. In particular, these organisations have highlighted issues with workforce capacity and increasing delays to images being reported. For example, the 2016 RCR annual workforce census showed that 97% of radiology departments in the UK said they were unable to meet reporting requirements

^{*} See appendix A for further information on the types of radiology exam.

within contracted hours.⁷ This was supported by findings of the 2017 NHS Benchmarking radiology service report, which found that report turnaround times had deteriorated and reporting backlogs were evident across responding sites, with the majority of delays for plain film X-rays.⁸

In light of all of this evidence, we carried out a review of radiology reporting to understand if this was a more widespread problem across NHS trusts in England. In November 2017, we sent an information request to the chief executives of all NHS acute (151) and community trusts (19) and asked them to tell us about the timeliness and governance of radiology reporting in their trusts between August 2017 and October 2017. As part of our analysis of responses, we selected a group of 30 trusts to look in detail at their numbers of unreported images.* This report sets out the key findings from our information request and makes recommendations about improving radiology services for patients.

* See appendix B for full methodology.

1. Performance monitoring and governance processes

As part of our information request, we looked at the governance and operational frameworks around radiology reporting, to identify whether there were any common themes that would indicate poor local monitoring of report turnaround times. In this section, we look in more detail at trusts' monitoring and escalation arrangements.

1.1 Key performance indicators

We looked at the key performance indicators (KPIs) organisations had in place to monitor report turnaround times. Of the 151 acute trusts that we contacted, 14 told us that they had no formal KPIs in place to monitor report turnaround times. Three trusts told us that they monitored the turnaround time for the entire patient's pathway through radiology, for example from the date the request was received to the date the report was completed.

Of the trusts that had KPIs for turnaround times in place, just under a quarter had general KPIs that applied to all types of diagnostic imaging. For example, a seven-day KPI across all imaging activity or, at another trust, 90% of images to be reported within 24 hours.

However, over two thirds of trusts told us that they had more specific KPIs in place, which again varied by length and structure. KPIs were often structured around the urgency or referral source rather than the examination type, with shorter turnaround times for urgent patients, and turnaround times being the shortest for emergency department patients. The KPIs that tended to be longest were for routine, outpatients and GP requests. Example of the ranges of KPIs within the sample group by referral group include* :

- Urgent or fast track – from two days to five working days.
- Routine – from seven days to three weeks.
- Emergency department – from one hour to two working days.
- Inpatient – from 24 hours to 60% of reports within 72 hours.
- Outpatient – from five days to an informal KPI of 90% within 21 days.
- GP/direct access – from 95% of reports within 24 hours to an informal KPI of 90% within 21 days.

The longest KPIs within the dataset as a whole, were six weeks for any routine examination (three trusts) and a KPI of eight weeks for outpatient plain film X-rays at another trust.

Where KPIs were broken down by imaging technique, they were often also structured by referral source. For example:

- Plain film X-ray – at one trust, KPIs varied from one hour for critical pathways up to three weeks for all routine plain film reports. At another trust, an informal KPI of 48 hours applied to all plain film reports and two trusts reported an eight-day KPI.
- MRI – reports within one hour to 48 hours for emergency department examinations. The longest KPI for MRIs within the sample group was three weeks for routine examinations.
- CT – from being reported immediately for urgent examinations up to three weeks for routine examinations.

* See appendix B for details

A small number of trust responses only covered particular examinations or patient pathways. For example, one trust had a set of KPIs for urgent inpatients and another set of KPIs for cancer pathways, but it was not clear from the response whether KPIs were in place for all other patients.

There are little in the way of national standards for trusts to be able to benchmark themselves against, so trusts can be unclear about what good looks like. National standards relating to report turnaround times are limited to the national Seven Day Services Clinical Standards, which provide standards for all inpatient examinations, and specific recommendations from the National Institute for Clinical Excellence (NICE), for a limited range of emergency department pathways such as head injury, major trauma and non-complex fractures.^{9,10,11,12}

This huge variation poses a number of issues for both patients and local trusts. The time taken for reports to be finalised differs on a trust-by-trust basis. As a result, patients may wait different length of times to receive their results depending on which trust they use. For example, from the information we received, a chest X-ray for a GP patient would probably be reported within two days at one trust, but at a neighbouring trust 15 miles away it could take up to 10 days.

1.2 Governance and monitoring of KPIs

Our inspections at Portsmouth, Kettering and Worcester showed that the trusts were monitoring report turnaround times, but we found that this monitoring was not always effective and, where leaders knew about reporting backlogs, escalation processes were either ineffective (as they had not improved the situation) or non-existent. This meant that the trusts only took limited action to address or mitigate the risks caused by the backlog.

Responses to our information request showed that the frequency and level at which monitoring was carried out varied. Where trusts were monitoring turnaround times well, there were dashboards in place that were updated regularly.* These dashboards included information such as:

- The percentage of scans performed and reported within KPIs.
- Average time (in days) from request to examination and examination to report.
- Specific NICE pathways, for example the percentage of suspected stroke patients receiving a head CT within an hour of admission.

* Dashboards allow an organisation to monitor performance against various KPIs.

Chelsea and Westminster Hospital NHS Foundation Trust

Chelsea and Westminster had a backlog of just over 15,000 unreported images at one site, and just over 6,800 unreported images at the other site. The trust told us that they had reviewed the backlog and had found 55 cases where the unreported images had had a positive finding. However, they had reviewed the patient notes and these findings had been actioned by the requesting staff at the time of the examination and none had resulted in harm to the patient.

The trust told us that they had sought advice from Portsmouth about the action they had taken to address their reporting backlog. In much the same way as Portsmouth, the trust had decided to auto-report all studies older than two years as the likelihood was that any positive findings either would have been detected subsequently or would have resolved. We asked the trust to provide us with monthly progress reports and as at May 2018 the trust had cleared the backlog at both sites. See section on auto-reporting for further information.

The trust told us that they have put in place standard operating procedures to make sure that referrers know when they are responsible for reporting the images. The trust is also monitoring the reporting situation at an executive level on a monthly basis.

A small number of trusts told us that IT challenges and technical issues with their Radiology Information System (RIS)^{*} and Picture Archiving and Communication System (PACS)[†] limited their ability to monitor turnaround times. Examples of the effect this had in practice included:

“We are unable to report the number of unreported examinations... due to the technical issues currently being experienced.”

“We have recently moved to a new RIS/PACS... However, we have experienced very significant operational difficulties during this transition and only now, some six months after go-live are we able to address this aspect of the service.”

Through inspections and other intelligence, we are also aware of how IT challenges have impacted on reporting itself. We heard how technical issues with the reporting platforms (RIS or PACS) had reduced reporting productivity in a number of trusts, leading to backlogs and delays in report turnaround times.

^{*} RIS is a system used for managing radiology records, imaging examination requests and appointments.

[†] PACS is a system used for short and long-term storage, retrieval, management and display of radiology images.

IT issues and report turnaround times

Five NHS hospitals in the East Midlands formed a radiology consortium (EMRAD) from December 2015 (with three further trusts finalising details to go live). This consortium, which has vanguard status and national funding, was to replace existing RIS and PACS and to enable images and reports to be shared across the consortium hospitals.

During the installation and for several months following the changeover to the new system, we became aware that multiple trusts had been experiencing severe issues with the stability of the IT systems and poor NHS IT infrastructures. This had meant that images, at times, were unavailable to various members of staff across the hospital to review or report, and reduced functionality had meant that reporting productivity had massively reduced. Trusts told us about a significant drop in productivity (50% in some cases). For example, during an inspection we saw the system take 45 minutes to log on, which staff claimed was not unusual. Problems had affected all trusts within the consortium to varying degrees, but we found that not all trusts had managed the risk appropriately.

We saw a comprehensive error log during an inspection showing the problems experienced at one trust with their IT systems. We were told that this error log was discussed regularly with the suppliers. However, we observed multiple entries where the suppliers did not give timescales for resolution and consistent upgrades that did not solve the problems.

We are assured that the stability of the IT systems have now significantly improved, but because of how long the system has been unreliable, some trusts are still recovering from the drop in productivity. The teamwork among the consortium has meant that many of the expected benefits from the collaboration are now being seen and images can be shared within the region, where expert radiologists and multidisciplinary teams can view them in their fields and insourcing between sites is possible.

How frequently performance was monitored and at which management level this was carried out varied between trusts. Reviews and monitoring by radiology teams took place daily, weekly or monthly, and some trusts carried out a combination of these. For example:

- Daily monitoring of patient tracker lists by the head of each radiology area, for example, CT, MRI and ultrasound.
- Weekly review of waiting and reporting turnaround times at radiology management team meetings, at which actions needed were discussed.
- Daily system checks by operational managers, with weekly statistics reported from the RIS, and monthly senior management meetings to review trends and action needed.

Examples of good practice in governance

- Daily data from RIS produced by radiology, showing the length of time each examination had been waiting to be reported, and the radiologist that it had been allocated to.
- Daily performance data sent to the divisional manager, with monitoring at monthly divisional performance and governance meetings, and escalation to a board sub-committee as needed.
- Weekly radiology meetings to look at turnaround times alongside capacity and demand, with data available through a dashboard updated twice a day. A weekly divisional meeting was also held at which radiology performance was discussed, considering the wider impact on other trust targets, such as the 18-week referral to treatment time and 31-day cancer targets.

1.3 Triggers, escalations and actions

Where trusts were monitoring their reporting performance, most had triggers in place to alert them to the fact that a backlog was starting to develop. While most trusts had specific actions in place to address turnaround times, the triggers used varied. Some trusts had one trigger to identify backlogs across all types of radiology examination, while others used types examination and/or patient pathway.

Examples of triggers alerting trusts to backlogs:

- A trigger when a KPI is breached.
- A trigger based on number of days. For example:
 - Reports waiting more than 21 days for GP and outpatient examinations. This reflected the KPI in place at the trust for GP patients, but meant that the outpatients KPI of 72 hours would be breached by 18 days before the trigger was reached.
 - Any examinations waiting over 28 days, regardless of imaging technique. At this trust, the KPIs were based on a percentage being completed within a certain number of days, the longest being 10 days for outpatients.
- A trigger based on the volume of unreported examinations. For example, backlogs of:
 - Over 350 unreported examinations, with over 500 unreported examinations triggering urgent action.
 - Two weeks' worth of activity per type of radiology exam that was unreported.

When backlogs were identified or trigger points had been reached, trusts described a variety of actions used to address risks to patients. These included:

- Re-prioritisation – triaging unreported examinations in terms of risk and urgency, or moving staff time to enable timely reporting.
- Insourcing – this included sharing the backlog of outstanding examinations between the radiologists own staff; employing locums or agency staff specifically to deal with the backlog or paying in-house staff for additional reporting sessions outside of their normal working hours.
- Outsourcing – this was the main action taken in some trusts, while for others outsourcing was only used when other actions, for example being able to manage the backlog internally, were not possible (see section 2.1).
- NHS support – one trust reported that it was part of a consortium, through which it could request local NHS reporting support.

Example of good practice in monitoring, escalation and action

The RIS/PACS team at one trust carried out daily checks on unreported examinations. Any examination unreported on by day six (with a KPI of eight days for all examinations) was either outsourced or allocated to a named consultant who had 48 hours to report. This was seen to be effective and from the data they provided, we saw their mean reporting time for all types of radiology examination and priorities was 1.43 days and the percentage of breaches of their KPI was 1.88% (Aug), 0.86% (Sept) and 0.71% (Oct).

1.4 National performance against KPIs

The aim of our review was to look at the national picture around radiology reporting and understand if the problems we found were unique to the three trusts we inspected or if it was a wider problem. However, from the data it was not possible to directly compare the performance of trusts because of the huge variation in the way local trusts had set KPIs. For example, a high percentage of breaches of a one-hour KPI may not indicate worse performance than a low percentage of breaches of a six-week KPI.

We received information on breaches of KPIs that could be broadly transcribed into a single dataset (although still with some important caveats) from 72 acute non-specialist trusts. Across the 72 responses, the data was supplied in a range of formats, including by imaging technique, degree of urgency (for which the definitions were often inconsistent), and different time periods.

Even for urgent examinations, it was clear that there was no agreement among trusts about how quickly an examination should be reported. For example, for urgent MRI examinations one trust showed breaches of 34.5% against a 48-hour KPI, but another trust had an 11% breach of seven-day KPI. Some trusts had KPIs for routine examinations that were shorter than those set by other trusts for their urgent examinations, for example one trust showed a 3.9% breach of 72-hour KPI for routine CT examinations.

East Kent Hospitals University NHS Foundation Trust

East Kent Hospitals had just under 8,300 examinations outside of their KPI. We chose to meet with this trust due to the size of the backlog, the fact that the trust KPIs were at the longer end of the reporting spectrum, and because radiology were not reporting most inpatient plain films and emergency department chest and abdomen X-rays. The trust told us that the maximum waiting time for an examination to be reported was approximately 35 days. We were told that the reporting challenges were due to a number of reasons, including locum radiologists that had left at short notice and shortages of radiographers meaning the reporting radiographers were needed to work clinically. The trust also told us that their RIS was unstable and had frequent outages, one of which had resulted in 8,500 examinations waiting to be reported.

To address these challenges, the trust told us they were increasing the number of reporting radiographers and consultant radiologists. They were also increasing the amount of cross-site working as one site in their trust was particularly hard to recruit to. We asked the trust to provide us with monthly progress reports and to carry out an audit of the presence and accuracy of the reports performed by non-radiology staff. As at 16 April 2018, there were 256 CT and MRI examinations waiting longer than 14 days for a report. However, the trust did not provide us with any information for the other types of radiology exam. We are still waiting for the results of the audit at the time of publication.

2. Managing reporting workloads

2.1 Outsourcing

Outsourcing is a common method used by trusts to reduce reporting backlogs. This is where images are sent electronically to an external provider (normally independent) to report. Radiologists, or occasionally reporting radiographers, will report these images either from home or from other offices in the UK and sometimes internationally. Outsourcing is commonly used overnight, especially at smaller trusts, as this means the trust radiologists are not required to work on night shifts (or work on-call) and will therefore be available in the department during the day. However, there is also demand to outsource normal working day activities to reduce backlogs. The two main types of outsourcing services used by trusts are:

- Hot reporting/out-of-hours – for example, urgent emergency department CT scans that are performed out-of-hours. These would be reported on and returned to the trust within an hour by radiologists working for independent providers.
- Cold reporting/in hours – for example, where a trust is experiencing reporting backlogs, trusts may use independent radiology reporting companies to take specified numbers of scans to report. That company will then send reports back to the trust to action within an agreed timeframe.

Responses we received from the acute NHS trusts (excluding the specialist centres) indicated that 102 trusts (76%) were outsourcing at least some of their radiology reporting work to external companies in an effort to keep up with demand. A number of responses indicated that individual trusts had contracts in place with several outsourcing providers. Our figures are similar to those from the RCR 2016 census where 78% of respondents said that they outsourced images.¹³ The census also put the amount spent on outsourcing into perspective. In the UK as a whole, £88 million was spent on outsourcing/insourcing, which the RCR calculated as the equivalent of the combined salaries of 1,028 consultant radiologists.

The mean percentage of total examinations outsourced by individual trusts was 8% (median 5%) from the responses received. The maximum (before disaggregating to in hours and out-of-hours) was 41% at one trust.

Some trust responses suggested that their ability to reduce reporting backlogs through outsourcing was limited. For example, one trust commented on issues with turnaround times by outsourcing companies, and that at certain periods outsourcing capacity has been unable to meet demand. Another trust told us that the outsourcing company they used had capacity issues with reporting chest and abdominal plain film X-rays.

At another trust we again found issues with RIS and PACS had prevented them from using outsourcing as a way of reducing their reporting backlogs. These issues were also raised by several trusts during engagement meetings we held with them to discuss their reporting backlogs.

Trusts need to assure themselves that the radiologists employed by the outsourcing companies are appropriately trained (and registered with the General Medical Council if they are to also undertake the justification of imaging request), that clinical audits of the quality of the reports are performed and that systems are in place to flag up urgent and unexpected findings. Justification is the process of weighing up the expected benefits of the examination against the possible risk.

Following a review of our inspection methodology, we will be inspecting and, for the first time, rating outsourcing companies based in England this financial year (2018/19).

2.2 Auto-reporting

All radiology examinations should have a documented report, especially those involving ionising radiation such as plain film X-rays, CT and nuclear medicine, where it is a legal requirement.¹⁴

One way that trusts can manage the radiology reporting workload is to identify which examinations could be reported by non-radiology staff. This process is known as auto-reporting as it involves sending a standard response automatically to referrers, informing them that the examination will not receive a formal radiology report and that it is their responsibility to provide one. (This process is different to situations where non-radiology staff review images shortly after they are taken to direct treatment, such as when checking to see if a patient in emergency department has broken their wrist and needs a cast applying, as these images will also receive a formal radiology report at a later time.)

Auto-reporting may be an appropriate tool for managing workloads in some circumstances, for example for follow-up images for patients attending fracture clinics where the initial X-ray has been reported by a radiologist or a reporting radiographer, and subsequent images are to assess healing.

However, as seen from the Portsmouth hospital inspection findings, there is a potential risk of harm to patients associated with non-radiology staff reporting images that do not receive a separate formal radiology report. This is especially a risk for chest and abdomen X-rays, where general medical training does not constitute adequate training. Non-radiology staff may be able to spot large cancerous masses and other obvious pathologies, but may miss smaller, more subtle cancers that are more likely to respond positively to treatment and lead to a better outcome for the patient when they are caught early.

Responses to our information request showed considerable variation in the governance, type and amount of reporting by non-radiology specialists. For example:

- 16 trusts (11.9% of respondents, excluding specialist trusts) stated that all imaging examinations carried out within the radiology department were reported by either radiologists or reporting radiographers, including all plain film X-rays.
- Plain film X-rays was the most common imaging technique to be auto-reported.
- Eight trusts delegated cardiac MRI, CT and/or Nuclear Medicine imaging to cardiologists.
- 117 trusts (87.3%) delegated the reporting of plain film X-rays of the limbs from orthopaedic referral sources to the orthopaedic doctors. This was for fracture clinics, outpatient clinics and/or post-operative orthopaedic plain film X-rays.
- Other areas we found where plain film X-rays were auto-reported were:
 - Intensive care and high dependency unit chest X-rays (18)
 - Chest X-rays from chest outpatient clinics (14)
 - Rheumatology extremity X-rays (10)
 - Abdomen X-rays from urology outpatients looking for kidney stones (8).

We followed up our original request for information with additional questions to 18 trusts that said radiology did not routinely provide a report for inpatient, outpatient and/or emergency department images, to ask about local governance processes and monitoring of report accuracy. We also asked what assurances these 18 trusts had that non-radiology staff were appropriately trained for this task.

A number of trusts stated that they felt their medical staff were adequately trained to report images, for example, “We work on the basis that all medical staff have undergone image interpretation as part of their studies, and are working under the guidance of a clinical specialist in their field.” They also stressed that if the medical staff felt that the image was outside of their area of expertise they could request a radiology report.

In response to the letter and media attention around the release of the Portsmouth inspection report, some trusts had reviewed the risk and had since started producing a radiology report for all chest X-rays, while other trusts told us that they had reviewed the training they provide for non-radiology staff who report X-rays. However, all trusts confirmed they had supporting measures in place to make sure that a radiology opinion was available if requested.

The range of responses we received to our follow-up questions show that there is no agreement on what constitutes adequate training for non-radiology staff that are responsible for reporting on images that do not receive a formal radiology report.

3. Staffing

3.1 Radiologist vacancies

Demand for radiology services is increasing year-on-year, especially for CT and MRI examinations, which take longer to report than plain film X-rays – it may take 10 times longer to report a CT or MRI than a plain film X-ray.¹⁵ Delays in reporting radiology examinations, and backlogs in reporting, are made worse by issues with staffing as there are not enough radiologists to meet current demand.

Responses from our information request show that the majority of trusts had vacancies for radiologists, with the highest vacancy rate at 65.2%. The average (mean) vacancy rate across all responding trusts was 14%. In total, the trusts who provided information on radiologist staffing (118 out of 134 non-specialist trusts) reported 391.4 whole-time equivalent (WTE) vacancies. This supports findings from the RCR and NHS Benchmarking that have shown ongoing issues around the recruitment and retention of radiologists. A lack of staff is a key contributing factor to the delays and backlog in reporting on radiology examinations.

In light of this, trusts need to make sure that they are using the staff they have as effectively as possible. For example, at one trust they had completed a directorate-wide team job planning review. This was performed across nine subspecialty teams and 74 consultants. Since the introduction of this exercise, the number of examinations waiting longer than 14 days had “fallen dramatically”, and they no longer needed to outsource any plain film X-rays. Another trust told us they were using radiologists’ time better by providing secretarial support for planning multidisciplinary team meetings.

King’s College Hospital NHS Foundation Trust

King’s College Hospital NHS Foundation Trust had a backlog of 33,400 unreported images (the oldest images had been waiting to be reported for eight months). This backlog had been caused by a sudden decrease in the number of radiologists. The trust had identified the problem early on but had struggled to recruit radiologists and find an outsourcing company who could help with reducing the reporting backlog, despite the trust making funds available to address the situation.

We discussed the measures they had put in place, including the recruitment of additional consultant radiologists, a contract with an outsourcing company, the introduction of protected reporting time for reporting radiographers and the use of locum radiologists. The trust told us that they had reviewed the situation and had not discovered any patients that had come to harm because of the delay in reporting their examinations. We asked the trust to provide us with monthly progress reports and, as of July 2018, the backlog had been reduced by 62% to 13,708 compared with the situation in December 2017. They told us that they had also successfully recruited 10 consultant radiologists and were continuing to outsource examinations.

Lewisham and Greenwich NHS Trust

Lewisham and Greenwich NHS Trust has two similar sized hospitals both with emergency departments; the Lewisham site had almost no unreported images outside of KPI (365 studies), while the Queen Elizabeth site had a backlog of 8,700 examinations outside of their KPI. We discussed what the trust had done to address this imbalance in reporting performance across the two sites. The trust told us that the radiologists at the site with no backlog were able to manage the reporting of plain film X-rays by providing an insourcing service to the trust. However, this service was at capacity and IT issues meant those radiologists were not able to view examinations performed at the other site on suitable PACS monitors, so even if they had capacity this would not be an appropriate solution. The trust also told us that the reporting of plain film X-rays had not been included in the radiologists' job plan but that a recent review had managed to increase the time for plain film reporting by two hours (split between four radiologists).

The trust had arranged outsourcing contracts with multiple companies to address the backlog and they were monitoring the situation on a weekly basis. The trust was also in the process of recruiting some new consultant radiologists and reporting radiographers. We asked the trust to provide us with monthly progress reports and, as of May 2018, the backlog had been reduced to 291 examinations waiting longer than seven days to be reported

3.2 Reporting radiographers

Radiographers are trained primarily to carry out a wide range of imaging techniques. With additional training, some radiographers are also able to report on images. Reporting radiographers have been present in radiology departments for many years and the range of examinations they report has expanded from plain film X-rays to more complex examinations such as CT and MRI. There is evidence to show that, when trained appropriately, their reports are comparable to those produced by consultant radiologists.^{16,17,18} Reporting radiographers play a valuable role in reporting radiology examinations in a timely manner and reducing reporting delays.

During inspections at Worcester, Kettering and Portsmouth we looked at how the departments had used reporting radiographers. These three trusts all had radiographers reporting plain film X-rays, but there was no robust management of these roles. For example:

- In 2016, at Worcester Royal Hospital, we found that although there was a dedicated rota for radiographer reporting sessions, radiographers were not always being released from their other clinical duties because they had to cover radiographer vacancies. This meant trained reporting radiographers were required to work in the general department, for example taking X-rays, rather than undertaking their scheduled reporting sessions.
- At Kettering General Hospital in 2016, we found radiographer reporting sessions were not rostered or part of established job plans. This meant that reporting sessions were only carried out when reporting radiographers could be released from normal clinical duties. As a result, reporting sessions were sporadic and depended on staffing levels and out-of-hours shift working.

- At the Queen Alexandra Hospital in 2017, we found that some radiographers had been trained to carry out a wider scope of practice in relation to reporting, for example, CT head scans. However, due to a mixture of demand for other clinical duties (such as taking X-rays) and limited amount of support and time from radiologists, these radiographers were not able to continue with the reporting and were quickly de-skilled.

From the responses we received, all but one non-specialist acute trusts employed reporting radiographers in some capacity. Our findings showed that the number of reporting radiographers and the types of radiology examination that they covered varied.*

Although we would expect to see some variation based on the size of the trusts and the level of reporting that is outsourced, responses suggested that the number of reporting radiographers varied even for trusts of a similar size. Across all responses, reporting radiographers were most likely to report plain film X-rays. Other examinations commonly reported by radiographers included CT and MRI head, breast imaging and fluoroscopy studies. Several trusts told us that reporting radiographers could only report examinations when they were not needed to carry out clinical duties in the department.

Reporting radiographers were in training at a number of trusts and some indicated that they were hoping to increase the number of reporting radiographers through recruitment and training, or increase the range of reporting to include more imaging techniques.

Some responses mentioned collaborative working between trusts to support reporting radiographers. For example, two trusts told us about a joint initiative to train radiographers for reporting in collaboration with other trusts in their region and they were extremely encouraged by the potential this offered. This collaboration will increase the number of reporting radiographers across the three trusts by six in total (two at each trust).

Some trusts provided examples of how using reporting radiographers had helped to reduce reporting backlogs. For example, one trust provided details of how the employment of two WTE reporting radiographers has resulted in a drop in the level of outsourced reporting and compliance with the reporting turnaround times for that imaging technique.

Technological advances in reporting

We recognise the potential that artificial intelligence (AI) and machine learning developments have to shape the way radiology departments work, especially in the reviewing and reporting of images. According to evidence presented at a parliamentary select committee on artificial intelligence, in the next five to 10 years, diagnostic imaging will be “revolutionised” by machine learning.¹⁹

The RCR believes that these techniques should be seen as a diagnostic tool rather than a workforce replacement, and AI has the potential, by “weeding out” all normal X-rays, freeing up capacity to allow radiologists to work on the more complex studies.

It is clear that AI and machine learning, will have a place in radiology departments and it will be important in addressing some of the challenges radiology departments face in the medium to long term. However, this technology is not yet developed enough to be an immediate solution.

* A sonographer is someone who has been trained to perform and report ultrasound examinations. Sonographers have been excluded from the findings relating to reporting radiographers as reporting is usually done at the time of the examination and is included as part of the training to become a sonographer.

Conclusions and next steps

Our review aimed to look at the national picture around radiology reporting and understand if the problems we found at Worcester Royal Hospital, Kettering General Hospital and the Queen Alexandra Hospital were unique to these three trusts or if it was a wider problem. Broadly we found that radiology departments across England are facing a number of challenges when making sure that patients' examinations are reported in a timely manner. However, it was difficult to make direct comparisons between trusts because of the huge variation in practice.

Having a defined set of key performance indicators (KPIs) is the foundation for a good radiology service as they allow for effective performance monitoring, appropriate escalation of backlogs to senior management and help drive improvements in the service. However, there are few national standards for trusts to benchmark themselves against, provide guidance on what is acceptable practice in terms of report turnaround times, and in turn help them to set KPIs.

Once KPIs are set, it is important to have strong governance processes in place, with regular monitoring and clear processes in place for escalation when they are regularly missed or defined trigger points are reached. However, we found that the frequency and level at which monitoring took place varied. Similarly, how trusts addressed backlogs when they were identified also varied.

Outsourcing is a common method used by trusts to reduce reporting backlogs. However, this has its own challenges and trusts need to assure themselves that the radiologists employed by the outsourcing companies are appropriately trained (and registered with the General Medical Council if they are to also undertake the justification of imaging request), that clinical audits of the quality of the reports are performed, and that systems are in place to flag up urgent and unexpected findings.

We also found issues with auto-reporting, where examinations are reported on by non-radiology staff. As highlighted by the issues found at Portsmouth, there is a potential risk of harm to patients associated with this, particularly for chest and abdomen X-rays. While all trusts confirmed that they had supporting measures in place to make sure a radiology opinion was available if requested, trusts need to assure themselves that non-radiology staff who are responsible for reporting images are aware of this and that they are competent to perform the task. Trusts also need to make sure that audits are performed to make sure that reports are documented and accurate.

Even in trusts that are routinely monitoring turnaround times and performance against local KPIs, as well as putting measures in place to deal with unreported images, some are still not able to provide timely reports. This suggests that the problems we are seeing in reporting delays for radiology examinations cannot solely be addressed through improving governance and escalation processes in local trusts.

Staffing was another area of concern, with trusts reporting high vacancy rates and struggling to fill posts. From the range of responses we received it is clear that there is no agreement on what constitutes adequate training for non-radiology staff responsible for reporting images that do not receive a formal radiology report. It is also clear that the issues found at Portsmouth, Kettering and Worcester about reporting radiographers are not unique, and the skills of reporting radiographers are not always recognised or they are not being given protected time to report on radiology exams.

The issues being faced by radiology do not have a single solution and involve both local and national action. As part of the latest comprehensive inspection methodology, we have updated our inspection key lines of enquiry and provider information requests to make sure that we can inspect radiology services in more depth. We have also improved the resources we provide our hospital inspectors to make sure that they feel confident when inspecting diagnostic imaging departments. These changes will mean that we can monitor the reporting of imaging examinations as part of our inspections to make sure that radiology services are providing a safe, responsive, effective, caring and well-led service for patients.

However, the changes we have made will not in themselves address the challenges faced by radiology departments around making sure that patient examinations receive a timely report by an appropriately trained healthcare professional. Action needs to be taken now to agree what good looks like in terms of radiology reporting. This will allow departments to benchmark their performance and will improve the quality of care for patients.

CQC, NHS Improvement, NHS England, the Royal College of Radiologists and the Society and College of Radiographers all need to work together to action the following recommendations, which aim to improve radiology reporting and reducing the potential risks to patients caused by delays.

Recommendations

1. NHS trust boards should ensure that:
 - they have effective oversight of any backlog of radiology reports
 - risks to patients are fully assessed and managed
 - staffing and other resources are used effectively to ensure examinations are reported in an appropriate timeframe.
2. The National Imaging Optimisation Delivery Board should advise on national standards for report turnaround times, so that trusts can monitor and benchmark their performance.
3. The Royal College of Radiologists and the Society and College of Radiographers should make sure that clear frameworks are developed to support trusts in managing turnaround times safely.

Appendices

Appendix A: Glossary – types of radiology examination

Computed Tomography (CT) is a scan that combines a series of X-ray images taken from different angles around the body to create detailed cross-sectional images (slices) of the inside of the body.

Fluoroscopy is similar to an X-ray ‘movie’. The images are transmitted to a TV-like monitor in real time so that the body part and its motion can be seen in detail. Fluoroscopy is used to look at many body systems, including the digestive, urinary and reproductive systems and provides information on their function as well as anatomy.

Magnetic Resonance Imaging (MRI) is similar to CT in that it produces cross-sectional images of the body, but it uses strong magnetic fields and radio waves instead of X-rays. MRI is particularly good at looking at soft tissues such as the brain, ligaments, tendons and the spinal cord.

Nuclear medicine (NM) uses small amounts of radioactive material to diagnose, determine the severity of or treat a variety of diseases, including many types of cancer and heart disease. PET-CT and SPECT are similar but they combine the NM examination with a CT scan.

Plain film X-rays are two-dimensional pictures of the inside of the body. They are good at looking for problems in bones, teeth, the chest and some soft tissue areas, such as the abdomen, and are usually the first (and sometimes only) diagnostic imaging used to diagnose a disease or condition.

Ultrasound uses high-frequency sound waves to create an image of part of the inside of the body. A common example is using ultrasound to assess the growth and development of a baby during pregnancy. Ultrasound is also very useful for looking at abdominal organs and the heart.

Appendix B: Methodology – how did we carry out this review?

In November 2017, we sent an information request to the chief executives of all NHS acute (151) and community trusts (19) and asked them to tell us about the timeliness and governance of radiology reporting in their trusts between August 2017 and October 2017. We asked trusts to tell us about:

- Local key performance indicators (KPIs) for report turnaround times*
- The proportion of patients that had breached the KPIs
- The number of unreported examinations
- The process for monitoring reporting KPIs
- The triggers used to flag developing reporting backlogs
- The examinations not routinely reported by radiology
- Whether the trust outsources any radiology reporting
- Radiologist staffing
- The number of reporting radiographers and the examinations they are trained to report.

We received responses from all trusts (151 acute and 19 community trusts). Most community trusts did not provide diagnostic imaging services directly (excluding community dental services), but had contracts with local acute trusts. This being the case, we excluded community trusts from the data analysis. Unless specified otherwise, we have also excluded specialist trusts (17 trusts in total), for example those providing only orthopaedic services, from the data analysis due to the different operational models they use.

Trust responses to the questions included in our letter were collated in a spreadsheet and responses for a sample of 30 trusts were selected ensuring coverage across regions, all rating categories and a range of trust sizes. We used a sample of responses because the wide variation in information provided by trusts made statistical analysis of the complete dataset impossible.

We also developed and tested a coding framework for the responses we received relating to the setting, monitoring and triggers related to KPIs as well as the number of reporting radiographers. Responses for the 30 trusts were then coded in software designed for qualitative analysis, MaxQDA 11, and the data analysed using the framework we had developed. Responses were coded from the collated spreadsheet, not directly from the responses received.

We sent a follow-up information request to any trust who told us they did not routinely report inpatient, outpatient and/or emergency department plain film X-rays. We asked them to send us additional information around their processes for ensuring that staff reporting plain film X-rays outside of their clinical expertise were competent to report and detect potential incidental findings, especially with regards to chest X-rays. This was an area of concern that had been raised during some of the previous inspections.

We also held meetings with trusts where data indicated that they had significant reporting backlogs. These meetings included discussions around how the reporting backlog had arisen, whether any patients had come to harm, plans to reduce the backlog and whether these plans were sustainable.

* A key performance indicator is a measure used to evaluate whether an organisation or department is meeting specific performance objectives.

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