Audit of radiology communication systems for critical, urgent, and unexpected significant findings

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Undertaken on behalf of The Royal College of Radiologists’ Clinical Radiology Audit Committee

AIM: To determine the compliance of UK radiology departments and trusts/healthcare organisations with National Patient Safety Agency and Royal College of Radiologist’s published guidance on the communication of critical, urgent, and unexpected significant radiological findings.

MATERIALS AND METHODS: A questionnaire was sent to all UK radiology department audit leads asking for details of their current departmental policy regarding the issuing of alerts; use of automated electronic alert systems; methods of notification of clinicians of critical, urgent, and unexpected significant radiological findings; monitoring of results receipt; and examples of the more common types of serious pathologies for which alerts were issued.

RESULTS: One hundred and fifty-four of 229 departments (67%) responded. Eighty-eight percent indicated that they had a policy in place for the communication of critical, urgent, and unexpected significant radiological findings. Only 34% had an automated electronic alert system in place and only 17% had a facility for service-wide electronic tracking of radiology reports. In only 11 departments with an electronic acknowledgement system was someone regularly monitoring the read rate.

CONCLUSION: There is wide variation in practice across the UK with regard to the communication and monitoring of reports with many departments/trusts not fully compliant with published UK guidance. Despite the widespread use of electronic systems, only a minority of departments/trusts have and use electronic tracking to ensure reports have been read and acted upon.

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Introduction

Imaging investigations are usually an important and often essential step in the patient pathway. Failure of the imaging process can have serious consequences, resulting
in patient harm. After receiving a number of reports of patient harm due to failed communication in 2007 the National Patient Safety Agency (NPSA) published safer practice notice 16, “Early identification of failure to act on radiological imaging reports”\(^1\) and this was followed by the Royal College of Radiologist’s (RCR) publication “Standards for the communication of critical, urgent and unexpected significant radiological findings”, first published in 2008 and revised in 2012.\(^2\)

The imaging process includes not only performing the examination, but also the issuing of the verified report and the communication of this report to the referrer, all within an appropriate time frame. Responsibility for this process lies with a range of individuals as is clearly set out in the 2012 RCR publication:\(^2\)

“It is the responsibility of the radiologist to produce reports as quickly and efficiently as possible. It is the responsibility of the requesting doctor and/or their clinical team to read, and act upon, the report findings as quickly as possible. It is the responsibility of the trust, or other equivalent healthcare organisation, to provide systems, whereby as soon as a verified imaging report has been produced, it is easily available to be read and acted upon by the referrer, their team and other relevant clinicians.”

Both the NPSA and the RCR documents emphasise the need for fail-safe back-up mechanisms and safety-net procedures to ensure that the communication of reports is reliable, and especially so in the case of critical, urgent, and unexpected significant findings. The introduction of a range of electronic systems for requesting examinations; issuing reports, and where appropriate alerts; and acknowledging receipt of reports facilitates these communications and is now well established in a number departments.

The electronic fail-safe alert technology works by a radiologist creating an alert by clicking a “fail-safe alert tab” on the radiology information system (RIS) or teleradiology platform (picture archiving and communications system [PACS], voice recognition system [VRS], teleradiology platform/electronic patient record [EPR]) that is sent out via a global standards HL7 ORU message as an abnormal flag in OBX segment field 8. A software application such as EPR, Ordercomms, standalone application, or general practitioner (GP) system is then used for reading the report.

Fail-safe alerts for radiology reports can either be communicated by electronic means (using HL7 messaging) or manual processes (telephone, fax, etc.). Currently most NHS trusts use both mechanisms for reasons described below. From a technology point of view, radiology reports are created in a radiology reporting application, which is a RIS or a teleradiology platform in the majority of hospitals (iReporting function maybe a be part of PACS in some institutions [e.g., Wales where the reporting application is part of PACS] or EPR [e.g., the Cerner RIS is a module of the EPR]).

IT systems that are used for reading and acknowledging radiology reports should be a part of a hospital EPR or GP system, which allows consultants and GPs to read and acknowledge reports in the context of comprehensive clinical information (blood results, histopathology, endoscopy results, clinic letters, and discharge summaries, etc.) for that patient. Acknowledgement of results is critical for patient safety. On the reading and acknowledging IT applications (whether it be the Hospital EPR or GP system), the consultant or GP must be able to create a worklist of all reports (based on referring responsible consultant/GP), and also be able to filter out the fail-safe alert reports, i.e., reports with an abnormal flag (so that they can deal with them before the others).

There are various mechanisms within NHS departments detailing how manual fail-safe alerts are created within RISs (using short codes, or fail-safe worklist within RIS, etc.) and also how they are communicated; whether by radiologists themselves or by secretarial/clerical staff. An ideal workflow within RIS would be: a radiologist would click on a fail-safe tab on RIS/teleradiology platform when reporting (dictation or voice recognition). RIS would send the reports to a fail-safe worklist within RIS (or Teleradiology Platform). Radiology secretaries/clerical staff would have access to “fail-safe alert worklist” of reports on RIS, and they can make the fail-safe communication telephone call to the consultant’s secretary, GP surgery, or MDT coordinator. Within the RIS, clerical staff should be required to document when they communicated the alert, and whom they communicated it to, if they wish to take it out of the fail-safe worklist. There should be an audit trail. This is an efficient way of fail-safe communication, which prevents radiologists spending time chasing clinicians and secretaries.

RISs (and teleradiology platforms) should support both methodologies for fail-safe alert communication. In the future, as NHS trusts move to becoming fully paperless, it is likely that manual processes for fail-safe alerts will not be required. In 2010, the RCR published a further related guideline “Standards for a result acknowledgement system”.\(^3\) The aim of this national audit was to determine how compliant UK radiology departments were with this published guidance, and to determine how they had achieved compliance.

The standards being audited were (1) departments should have a policy in place for radiological imaging reports that require particularly timely and reliable communication; for example, abnormal, unexpected, and/or critical findings (NPSA)\(^1\) and (2) trusts/organisations should ensure service-wide electronic tracking of radiology reports (i.e. whether radiology results have been read or not).\(^2\)

Materials and methods

In January 2015, all UK radiology department audit leads listed on the RCR audit lead database were invited by email to participate in this audit: the email included a web-accessed electronic questionnaire (Survey Monkey) link. This questionnaire comprised 19 questions covering departmental type; RIS/PACS/VRS; current departmental policy regarding the issuing of alerts; use of automated electronic alert systems; practicality of notification of clinicians of critical, urgent, and unexpected significant radiological findings; monitoring of results receipt; and examples
of the more common types of serious pathologies for which alerts were issued. Follow-up emails were sent to audit leads and clinical directors in February. Data collection ceased in April 2015.

Results

One hundred and fifty-four (67%) of the 229 invited departments responded. Responses were received from radiology departments across the UK, with representation from all four countries. The bulk of responses were from district general hospitals 101 (66%), with 46 (30%) from university teaching hospitals and seven from other departments, such as specialist centres, reflecting the mix of department type in the UK.

One hundred and thirty-six of 153 departments (88%) indicated that they had a defined policy in place for the communication of critical, urgent, and unexpected significant findings, and of these, 102 (75%) had agreed this policy with referrers. One respondent was not aware whether they had a policy in place.

Only 53 departments (34%), however, had an automated electronic alert system where the reporter clicks on a “send to fail-safe” tab, 35 to all referring clinicians including GPs, and 18 for hospital clinicians only. As described previously a “send to fail-safe” tab may simply result in manual processes of fail-safe alert communication, i.e., require someone in the department to make a phone call or send a fax; however, if the click of “send to fail-safe” tab also generates an OBX8 abnormal flag (in the background), then there is an electronic communication from RIS to EPR. This level of detail was not collected in this audit.

Only one department bought a RIS/PACS product with an integrated electronic alert system. One department had its own bespoke RIS/PACS system with integrated electronic alert system; the others had received funds from a variety of sources, which included risk-management budgets, trust initiatives, and department budgets to finance the purchase/installation of their electronic alert system. In 31 departments the electronic alert system formed part of the RIS/PACS/VRS system. In 21 others it served as an additional bolt-on system. A range of vendors do now offer some type of electronic alert system, but it would appear that this is generally seen as an “extra” and not an essential part of the system. The range of combinations of PACS and RIS systems used by respondents was wide: seven different PACS and eight RIS systems with 20 different combinations. It would appear from these data that many equipment combinations currently in place do allow an electronic fail-safe alert system to be used.

Of the 53 departments with an electronic alert system, only 50% of these had an electronic read acknowledgement system, i.e., of the 154 responding departments only 17% were compliant with RCR guidance on the responsibility of the trust/organisation to ensure service-wide electronic tracking of radiology reports. Of these 26 departments, in only 10 was this a full-read and acted upon acknowledgement system. The system used varied across these 26 departments, with 11 using it for all reports and 15 departments only for reports with an attached electronic alert. What also varied was who was responsible for monitoring the read reports. In only 11 of the 26 departments an electronic acknowledgement system, was someone regularly monitoring the read rate. In two departments the medical director held responsibility for this task, in three the radiology clinical director, in two the directorate manager, and one of each of the following: the radiology superintendent, the IT department, the audit department, and the hospital safety department. One department indicated that responsibility for monitoring was under discussion. Therefore in 15 departments, although available, the result-acknowledgement system was not being used.

Of the 53 departments with an electronic alert system, only three relied solely on this to notify hospital clinicians, and only two to notify GPs. The majority of departments also had a range of safety-net procedures in place, such as contacting referrers by telephone, e-mail, and fax, and also notifying the relevant multidisciplinary team (MDT) co-ordinators, as advised by the NPSA report. The departments without electronic alert systems used a similar range of methods to contact referrers. Table 1 illustrates the range of non-electronic procedures that departments use to notify referrers of critical, urgent, and unexpected significant radiological findings.

Outsourcing is now widely used across UK radiology departments due to workforce and workload issues. Seventy-one percent of the responding departments in this audit used outsourcing; however, many departments using outsourcing had no fail-safe method for passing alerts raised by the outsourced reporter to referring clinicians. Although the outsourcers themselves may have established procedures for issuing alerts back to the originating department, in only 21 departments were these passed on electronically to referrers, with 23 departments relying on secretaries to pass on this alert.

Emergency department red-dot systems provide a further type of alert, bringing the referrer’s attention to abnormalities picked up by the radiographic staff carrying out imaging. One hundred and twenty-five of responding radiology departments used a red-dot system with 88 (71%) of these routinely notifying emergency department staff if a fracture had been missed by the radiographer, and a further 33 (26%) notifying them sometimes.

The NPSA safer practice notice suggests that departments consider sending “standard letters to patients if

Table 1

Methods of communicating critical/urgent/unexpected significant finding

<table>
<thead>
<tr>
<th>Method of communicating</th>
<th>No. of departments using method</th>
</tr>
</thead>
<tbody>
<tr>
<td>Send copies of report to MDT co-ordinator/cancer office</td>
<td>105 (70%)</td>
</tr>
<tr>
<td>Phone result to consultant/secretary</td>
<td>106 (71%)</td>
</tr>
<tr>
<td>Fax result to consultant/secretary</td>
<td>95 (63%)</td>
</tr>
<tr>
<td>E-mail result to consultant/secretary</td>
<td>86 (57%)</td>
</tr>
<tr>
<td>Other</td>
<td>14 (9%)</td>
</tr>
<tr>
<td>Do not know</td>
<td>1 (1%)</td>
</tr>
</tbody>
</table>
an examination is abnormal [with these] generated at the same time as an alert is sent to the referring health professional.” This is, however, controversial and only one department indicated that it had introduced this NPSA advice.

Neither the NPSA nor the RCR guidance indicates what constitutes critical, urgent, and unexpected significant findings, and therefore, not surprisingly, what is included in local hospital policies is very variable. The range of new findings constitutes critical, urgent, and unexpected significance, and therefore, what is included in local hospital policies is very variable. The range of new findings constitutes critical, urgent, and unexpected significance.

Discussion

There is wide variation in alert system practice across the UK. Although it is now over 8 years since the NPSA published the safer practice notice, many departments are still not fully compliant with the guidance. NPSA responsibilities were transferred to NHS England in 2014 and the published patient safety alerts are now available through the NHS England website. This guidance is applicable only in England and Wales, but the RCR standards for the communication of critical, urgent, and unexpected significant radiological findings’ apply across the whole of the UK and have been in place for over 7 years.

At the time of publication of the NPSA guidance in 2007, there were 69 relevant logged cases in the NHS Litigation Authority database for the 10 years up to May 2006 “some of which involved significant harm and monetary claims”. The fact that there is now published guidance in place regarding the issuing of alerts and early identification of failure to act on radiological imaging reports, potentially makes individuals, departments, and hospitals more vulnerable if they have not implemented this guidance and as a consequence a patient has come to harm. The response rate received to this survey is the highest the Clinical Radiology Audit Committee of the RCR has ever received to a national audit, which may reflect widespread concerns regarding this issue.

Although many vendors now appear to have some type of alert system, how successfully this integrates with the other hospital and GP IT systems is not known. To address integration issues, lack of vendor software, or perhaps, because of the extra costs being charged by RIS/PACS/tele-radiology vendors, some departments have developed separate add-on IT products with the inherent risks of these becoming obsolete as the other systems are upgraded. When there is a multivendor environment in the NHS for RIS, EPR, and GP systems, it is critical that common global standards for communication are followed, i.e., communication fail-safe alerts via OBX field 8 sending out an abnormal flag.

For any alert system to work requires someone to be present to receive, see, and act upon alerts. Alert systems that require human input, such as a medical secretary forwarding or receiving messages by telephone, fax, or printing paper copies, will not work outside standard Monday to Friday working hours. This may incur a delay of several days if telephone messages, faxes, or automated outsourced report alerts are sent/received on a Friday evening; however, although automated alert systems do offer 24 hour, 7 day cover this does not mean the result is viewed out of hours. This, therefore, requires the reporter to make direct contact with the referrer and is common practice in emergency situations, but is less likely to occur with other urgent and unexpected results. Making direct contact with the referrer can be a time-consuming process, but has been addressed successfully in some institutions by the use of smartphone applications on the referrer’s phone, which require the recipient to acknowledge receipt of electronic alerts generated by the reporting radiologists. Technology can be used in the form of “push notification” of fail-safe alerts to the referrer’s smartphone; however, care must be taken that if such an application is used, it must be the responsibility of the referrer to configure the application themselves, defining who the notification should be sent to and for the type of patient. For example, emergency departments and inpatients push alerts might be sent to the on-call/emergency shift doctor’s smartphone for individual patients. Whereas for outpatients and GP alert notification, it might be sent at a particular time of day (9 am and 4 pm) simply informing the consultant/GPcovering individual, that there are a number of alerts awaiting review. The “alert push notification” application must be highly configurable with regard to who to send the notification to and when (weekend, weekday, and time of day) and must take into consideration emergency shifts/leave and other rota factors, as well as the type of patient. These applications automatically escalate the handling of messages over time until they are acknowledged. Alternatively all alerts are relayed to a secretary who arranges verbal contact between the referrer.

![Figure 1](image_url) Proportion of responding departments issuing alerts for demonstration of new cancer by cancer type.
and the radiologist as part of a round the clock service as described by Hirschorn.3

Electronic read acknowledgement systems complete an alert feedback system. Read acknowledgement systems are more robust because they require the clinician to acknowledge that they have read and will act on the result, rather than a simple read system, which simply implies the report has been opened. These applications should be part of the EPR software rather than the RIS. Very few trusts have them in place as yet, and it is of concern that the majority of those that do are not monitoring them. Who should be responsible for monitoring that reports are read? As there is no current HL7 standard for EPR results acknowledgement messages to be sent back to the RIS. It is not practical, nor is it appropriate for the radiology department to take responsibility for monitoring that reports have been read.

The responsibility for the receiving/communication of urgent or significant unexpected results varies from country to country. In the USA, for example, it is the radiologist’s judicial responsibility to verbally communicate urgent or unexpected results to the referring clinician within specified time frames4 and is illustrated in the Brigham and Women’s Hospital radiologist’s guideline to ANCR (alert notification of critical radiology results).5 This is not yet the position in the UK judicial system. The RCR clearly states in their standards for a result acknowledgement system6 that “it is the responsibility of the referring healthcare professional to view, act upon, and record the results of imaging studies that are requested.” This is reiterated in the revised 2012 RCR publication on the communication of critical urgent and unexpected significant radiological findings,2 where, in addition, they indicate that it is the responsibility of the trust/organisation “to ensure service-wide electronic tracking of radiology reports” and that the “processes involved should be auditable, transparent, and represent a clear trust policy”. The 2010 publication7 also makes reference to this. The implication here is that the trust/organisation should ensure someone is monitoring that reports are read, and acting on the results of this monitoring is the responsibility of the trust/organisation.

One major flaw encountered in all electronic feedback systems is the inaccuracy of the data entered into the system. In particular, the wrong “referrer”/“lead consultant” listed as being responsible for the study, and/or the wrong episode of care selected in the electronic requesting of examinations. Accurate, timely monitoring of read/acted upon results will highlight reports that have not been seen due to this issue, although delays are likely to be encountered.

Some of the responses received from participating departments suggest that not all radiologists and possibly other reporting staff are clear on local policies regarding the communication of significant findings. In order for referrers to have confidence in the system and to prevent patients coming to harm, as stated in the RCR publication (2), it is important that radiologists “ensure that the reports are timely, clear, and precise, and the urgency for action is documented within the content of the report”; “clearly document advice on further management or action where appropriate”; “contact the referring clinician or another appropriate member of their team, if they consider that there is danger of unexpected relevant information contained in the report not being acted upon”; “document the details of the named clinician/team member contacted, and the time and date of the communication (regardless of whether the communication was
successful or unsuccessful”). An electronic system in itself does not fulfil these recommendations unless the radiologist has confidence that it is being used reliably by the referrer and that there is no danger of the unexpected significant findings not being seen by the referrer. If there is an electronic system in place, used reliably by referrers, the time and date of the electronic alert and the name of the referrer to whom it has been sent would seem a reasonable way to fulfil the documentation requirements.

Although consistency across the UK in types of pathology/findings requiring alerts is not essential, it would seem advisable that there is consistency across a department so that the local clinicians can rely on and have confidence in the alert system. The range of pathologies listed for which electronic alerts could be generated is not intended to be exhaustive, but to act as a starting point for discussion as to what local teams would find useful. Other categories such as “acute abdomen requiring surgery” might also be appropriate. The issuing of alerts may also be dependent on the referrer, for example, a lung cancer seen on a GP referral chest radiograph would necessitate the issuing of an alert, the same finding on a chest clinic referral chest radiograph may not; this should be agreed in the local policy. It may be that for emergency requests, such as query pulmonary embolus, if one is found an alert does not have to be issued; again this can be agreed at a local level. It is also important that time frames for alerting referrers be agreed, e.g., next working day or out of hours. As with all guidelines, there should be some flexibility to allow individual reporters to act appropriately.

Outsourcing is used widely across the UK. Radiologists reporting outsourced studies must be aware of local policies on what constitutes a critical, urgent, or unexpected significant radiological finding, and ideally, there should be a seamless electronic method of these alerts being passed directly to referrers and not having to pass through secretarial systems with the high risk of associated delays, particularly when that department uses an electronic alert system; however, in the absence of robust electronic processes for reading and acknowledging, it is vital that teleradiology providers continue to use manual processes (similar to NHS) to alert clinicians of fail-safe alerts.

Action suggestions

- Any department intending to upgrade or replace their RIS system should specify the need for fail-safe alerts to be electronically communicated via abnormal flags in HL7 OBX8 to EPR or GP systems. They should also specify a need for an efficient and auditable workflow for radiologists to send fail-safe reports to a fail-safe worklist for manual process of communication
- Departments not compliant with current guidance on the communication of critical, urgent, and unexpected significant radiological findings should develop and implement protocols, installing software and procedures as appropriate to their circumstances
- Within individual departments there should be a clear policy as to what constitutes critical, urgent, and unexpected significant radiological findings so that there is a consistent approach to issuing alerts that the referrers can rely upon.
- All reporting radiology, radiographic, and administrative staff should be clear on the local policy and ensure that they use the local agreed procedures appropriately, including documenting any required urgent action within the content of the report.
- In addition to abnormal flags sent by fail-safe electronic alert systems, manual safety-net procedures (using telephone calls, fax, etc.) should also form an important part of the feedback process, as electronic alerts are currently not entirely reliable. This requirement may become redundant once NHS trusts are entirely paperless.
- Outsourced reports from teleradiology providers should be subject to the same policies and procedures as local reports. They need to have both electronic and manual processes of communication of fail-safe alerts (until such time that NHS becomes fully paperless).
- Trusts/organisations should ensure that their EPR has a read/acknowledgement system, which allows referrers to create a worklist of all their reports based on referring responsible consultant, with the ability to filter fail-safe alert reports. Referrers should have one-click access to full EPR to allow safe acknowledgement of reports in the context of comprehensive clinical information. Any person accessing reports should do so via their own unique login, so they are identifiable as the individual who read and, by implication, took responsibility for acting on the report.
- Each trust/organisation should ensure that a named individual/individuals within the hospital has/have responsibility for monitoring that electronic alerts, and indeed all reports, are read and that escalation policies are in place for unacknowledged reports.

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