

A practical guide to implementing Ordercomms and electronic remote requesting in radiology

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Foreword

The RCR recognises that information technology (IT) can greatly improve the patient pathway in clinical radiology, particularly in terms of patient experience and efficiency. The use of electronic requesting is one such area and we would encourage all organisations involved in the requesting of radiology investigations to invest in appropriate technology. However, there are many pitfalls in the delivery of a service and, therefore, we hope you will find this guidance useful in ensuring you obtain the major benefits from this innovation.

The Royal College of Radiologists (RCR) would like to thank and acknowledge the contribution to this important publication of the Board of Faculty of Clinical Radiology and the Clinical Radiology Professional Support and Standards Board and, in particular, the individual contribution of Dr Tony Newman-Sanders.

The previous edition of BFCR(10)19 *A practical guide to implementing Ordercomms in radiology* has now been withdrawn.

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Introduction

Electronic requesting (ER) systems were designed to enable clinicians to request diagnostic imaging (DI) procedures and receive updates on their progress using an IT system, replacing the need for conventional paper-based systems.

The terms 'order communications' (Ordercomms, OC) and less frequently, 'computerised physician order entry' (CPOE) are more or less interchangeable with electronic requesting.*

They describe an electronic system which enables bidirectional communication of patient information, clinical and diagnostic decision-making, the progress of the DI procedure and image report status between the referring clinician and the diagnostic imaging department.

This should be designed in such a way as to support appropriate referral of patients for diagnostic imaging and timely scheduling and reporting of the test.

The use of such systems has become widespread with the roll-out of picture archiving and communications systems (PACS) and radiology information systems (RIS) across the NHS. There has also been increasing use of these systems in general practice to improve access to diagnostic imaging.

* The term 'orders' has unfortunately been adopted by industry to designate imaging 'requests'. This follows from the application of these 'order comms/communications' remote electronic requesting systems to imaging, when they were originally designed for 'ordering' blood tests (mainly haematology and biochemistry). These were tests on blood samples that had already been withdrawn from the patient and merely needed to be run through a machine which produced an automatic print-out of the levels of various constituents in the blood sample, and as a result such 'orders' were rarely vetted and refused by a haematologist/biochemist (unless for reasons of the cost of performing a particular specialised test). Clearly, in imaging, the situation is different: these are truly 'requests' for investigations, which will often require the use of ionising irradiation (so IR(ME)R applies), are expensive, and time-consuming for the operator, reporter and patient. Such requests frequently require approval and vetting, and can often be modified or even refused (unlike 'orders'). However, since 'orders' has become the accepted term used by industry vendors, we have (reluctantly) used it in this document.

Designing electronic 'request forms'

The increasing deployment of comprehensive electronic patient record (EPR) systems – both within and outside the National Programme for IT – means that in the secondary or integrated care setting, ER functionality is now usually embedded within a wider EPR, often accessed from the context of the individual patient record or from other clinical workflows (such as A&E, ward or clinic patient lists) and is usually one module among many, enabling electronic requesting for pathology, endoscopy, other diagnostic tests, therapies and specialist clinical review. Each of these departments is served by a common user interface, with a dedicated pro forma or 'electronic form' to enter the information required for that specialty.

The first step in designing an electronic request pro forma is to ensure all the essential information is captured as was possible on paper request forms. There is then the opportunity to enhance the electronic pro forma by:

- Collecting additional relevant information
- Making some fields compulsory
- Providing clinicians with decision support tools.[‡]

Engagement with referring clinicians is an essential part of this design process.

Desirable features include:

- Access to the patient's electronic record and radiology examination history to avoid requesting duplicate or unnecessary examinations
- Pre-population of request fields based on information stored in the electronic record (such as patient demographics, location, principal diagnoses and allergies)
- Targeted information based on the user selection (for example, links to the relevant patient information leaflets)
- Necessary information required for particular tests; for example, MRI safety questions (see Appendix 1)
- Drop-down menus of clinical specialty-oriented requesting details which could be tailored to a particular type of user login
- Electronic diagram facility for certain requests, such as mammography, breast ultrasound, and arterial Doppler
- Alerts based on custom rules designed into the system (for example, if a duplicate examination request is made within a predefined interval).

[‡] This may include a link to the electronic version of validated guidance such as The Royal College of Radiologists' *iRefer: Making the best use of clinical radiology* (www.irefer.org.uk) formerly *Making Best Use of a Radiology Department*. More sophisticated systems are available which launch within the electronic requesting system prompting structured entry of clinical details and then use complex rules engines to generate a recommendation of the most appropriate test as well as launching links to relevant learning resources and evidence bases.

Integration of electronic requesting with other systems

At the present time, the RIS is central to the vetting and scheduling of DI requests and the primary requirement of ER systems is that they should connect seamlessly to the RIS system, with little or no requirement for manual data entry.

A prerequisite of an ER system is that a common unique patient identifier is used in both the requesting and the receiving system. With increasing networking and expectations that records can be shared between organisations, it is desirable for the NHS number (preferably verified) to be the primary identifier and that any secondary identifier has an organisation-specific prefix.

The data entered into the ER system needs to be mapped to the fields available in the RIS, and vice versa. It is unlikely the RIS will have a matching field for every request field, and it may be necessary to design the system to map several request fields into a single free text field in the RIS. The ability of the RIS to record and display this information is critical to whether the department can achieve paperless workflow.

In secondary and tertiary care, the patient administration system (PAS) usually provides the patient master index of patient demographics (name, date of birth, sex, address, PAS number, NHS number). It also holds the information regarding the patient's location and their responsible consultant at a particular point of a clinical episode. In primary care, the relevant GP system will fulfil the same function.

The systems must be integrated to enable patient registrations, updates and merges to be exchanged. These processes are catered for by standard health level 7 (HL7) transactions incorporated within the Integrating the Healthcare Enterprise (IHE) scheduled workflow and patient information reconciliation profiles, see Appendix 2.

In order for the system to provide sufficient intelligence to enable radiologists, radiographers and other DI staff to vet and prioritise requests (orders), a feedback loop is necessary to update the referrer as to the progress of the request (see Appendix 3).

It is also desirable for the referrer and DI staff to be able to access supplementary clinical information from the EPR (if available), relevant prior imaging history, including reports and images, and relevant pathology results from within the electronic requesting system. Ideally the system will have sufficient intelligence to 'pull' certain relevant information from other systems; for example, recent renal function for examinations requiring intravenous contrast medium.

A common user interface and consistent display parameters across ER systems, RIS and PACS are essential to ensure effective and safe requesting, vetting, scheduling and reporting workflows (see Appendix 4).

Remote electronic requesting and IR(ME)R

The *Ionising Radiation (Medical Exposure) Regulations 2000 (IR(ME)R)*¹ requires that employers have written procedures to enable identification of the referrer, operator and practitioner for any procedure using ionising radiation. Procedures for an electronic remote requesting system are similar to paper-based systems, but rely on a user's logon credentials to identify the referrer, instead of a handwritten signature. The trust's procedures should ensure it is a disciplinary offence to request a procedure using someone else's logon, just as it is to request a procedure on a pre-signed request card.

Electronic remote requesting systems can assist an employer in complying with the legislation by:

- Restricting referrals to users with appropriate access privileges
- Providing the referrer with recommendations concerning referral criteria for medical exposures, including radiation doses
- Ensuring the referrer provides the radiology department with required information to enable the practitioner to justify the procedure
- Maintaining a log of all requested procedures for audit purposes.

Results reporting and acknowledgement

ER is one element of an increasingly complex interface between PACS and RIS systems, which are traditionally centred on diagnostic imaging departments, and other electronic systems from simple PAS or GP systems up to and including comprehensive enterprise EPR systems.

In particular, the ability of referring clinicians and others to view results and images is crucial and should be integral to the function of an EPR. In the absence of such a system, other means of results notification and access to PACS and/or RIS is necessary. For stand-alone electronic requesting systems, it is desirable that the same system accommodates the facility for the referring clinical team to be able to read the imaging examination reports, on their patients' current (and previous) imaging examinations.

Functionality of this feedback should allow:

- Flagging of urgent/unexpected results by the radiologist, at the time of reporting. Flagging should be possible from within their speech recognition system or the PACS
- Electronic feedback of imaging results not only to the requesting doctor, but to their clinical firm (team)
- Synchronising of any changes to the reports especially addendums and multidisciplinary team meeting reports with upstream systems, including PACS, EPR and the electronic reporting system itself
- Easy access by the requesting clinician and their firm to all their imaging study requests, with their progress status, in reverse chronological order
- Visible acknowledgement on the system that a report has been read, when, and by whom, with a permanent audit trail
- Active acknowledgement by a member of the clinical firm (for example, by clicking a check box) that the report has been understood, (that is, that responsibility for acting upon the report of the imaging has been transferred to the clinician), with a visible record of the identity of that person, when the acknowledgement occurred, and a permanent audit trail.

NPSA Safer Practice Note 16² mandates that all healthcare organisations have robust systems and processes to ensure that significant abnormal and unexpected results are communicated to referrers, acknowledged and acted upon. The RCR has also published guidance in this area.³

Increasingly sophisticated automated messaging systems exist for proactively 'pushing' unexpected or critical results to the pager or mobile phone of the referrer and their team.

While IT systems can help, many departments remain dependent on manual processes including the use of the telephone, secure fax and email.

Planning and implementing electronic requesting systems

The increasing deployment of comprehensive EPR systems – both within and outside the National Programme for IT – means that in the secondary or integrated care setting, ER functionality is now usually embedded within a wider EPR.

The change from a paper-based system to remote electronic requesting enables the redesign of radiology services. Trusts implementing these systems should take the opportunity to process map their existing workflow, and consider how use of the technology can improve patient and staff experiences of the service. Options to consider include:

- Adopting a centralised booking service to co-ordinate appointments and provide patients with a choice of appointment times
- Ensuring clinicians have access to information and decision support tools to help them request the most appropriate investigations
- Providing radiology staff with electronic worklists to facilitate justification, scheduling and reporting of examinations, independent of the paper request card.

The involvement of radiologists in the procurement and deployment of these systems is of the utmost importance as the central role of diagnostic imaging in the delivery of healthcare increases. In practice, this means that radiologists need to play their full part in decision-making in the wider clinical informatics arena, not just when PACS or RIS systems are involved.

Summary

The use of electronic requesting for diagnostic imaging tests continues to increase across the healthcare landscape. Increasingly, elements of these systems and the feedback mechanisms they enable are being integrated or subsumed into other components of an increasingly comprehensive electronic patient record. In order

to maintain the core benefits of paperless requesting, build additional value for staff and patients and avoid new risks, it is vital that radiologists and other DI staff work closely with clinical and IT colleagues in the procurement, implementation and ongoing deployment of these systems.

References

1. Department of Health. *The Ionising Radiation (Medical Exposure) Regulations 2000 (together with notes on good practice)*. <http://www.legislation.gov.uk/ukxi/2000/1059/contents/made>
2. National Patient Safety Agency. *Safer practice notice 16. Early identification of failure to act on radiological imaging reports*. London: NPSA, 2007.
3. The Royal College of Radiologists. *Standards for the communication of critical, urgent and unexpected significant radiological findings, Second edition*. London: The Royal College of Radiologists, 2012.

Appendix 1. Desirable additional information/dialogue to optimise electronic requesting of DI tests

I. 'Read by referrer' exams

For example, plain X-ray requests for limbs post-fracture manipulation, fluoroscopy images in theatre, orthopantogram (OPT) and so on will have the following question.

Report required (radiology)

Is a report required? Yes/No

If 'No', a statement that the requesting consultant will record the result must be accepted.

II. Female and of childbearing age (For relevant exams only, all CT, MRI, fluoroscopy, some plain X-rays, NM and so on)

Pregnancy (radiology)

Is the patient pregnant? Yes/No

If yes, expected due date (EDD) DD/MM/YY. For MRI exams, the following message will appear. 'Please discuss the need for an MRI with a radiologist.'

III. Inpatient/A&E examinations

Infection (radiology)

Does the patient suffer from any infections which require barrier nursing? No/C difficile/MRSA/Hepatitis A, B, C/HIV

Mobility (radiology)

Mobility? Chair/bed/trolley/portable (if possible)

IV. Outpatient examinations

Transport (radiology)

Transport required? Own transport, medicar, ambulance

V. Questions for exams requiring iodinated IV contrast (CT with contrast, angiogram, intravenous urogram and so on)

Contrast-induced nephropathy risk assessment

The last serum creatinine level or eGFR was [xxx] on DD/MM/YY. (This will be automatically displayed from the results/pathology system)

Contrast-induced nephropathy risk assessment based on local guidelines/[RCR guidelines on IV contrast use](#)

Diabetes (Iodinated contrast exams only – not MRI)

Is the patient diabetic? Yes/No

If 'yes', is the patient on: diet control, insulin, metformin or medication other than metformin?

If on metformin, please read the [RCR advice regarding metformin and IV contrast](#).

VI. Questions for MRI exams

Absolute contraindications to MRI (radiology)

Does the patient have any electro-magnetic implants (which are MRI hazards) such as?

- Cardiac pacemaker
- Cardiac defibrillator implant
- Cochlear implants
- Brain/nerve/bladder stimulator and so on

Yes/No/Patient not present

If 'yes', patient cannot have an MRI scan. Please discuss with radiologist regarding alternative test.

Possible contraindication to MRI – safety assessment required (radiology)

Does the patient have any possible contraindications to MRI such as?

- Intracranial aneurysmal clips
- Retained shrapnel
- Metallic prosthesis
- Spinal rods
- Heart surgery
- Spinal surgery
- Brain surgery
- Recent surgery
- Shunts/vascular stents/vascular clips
- Others.

Yes/No/Patient not present

If 'yes', please provide details with date and type of procedure/implant. MRI staff will do a safety assessment prior to MRI.

Metallic intraorbital foreign body (MRI hazard) (radiology)

Does the patient have any history of a metallic intraorbital foreign body? (Please take relevant occupational history such as welder and so on)?

Yes/No/Patient not present

If 'yes', MRI will pursue with patient to ensure safety as per intraorbital foreign body policy for MRI.

Claustrophobia

Is the patient claustrophobic? Yes/No/Patient not present

If 'yes', do you think patient will require oral sedation or general anaesthetic (GA)? *(They will need to choose one of the options.)*

- *If they choose oral sedation, the following message will appear:* MRI department will discuss with patient and organise for oral sedation.
- *If they choose GA, the following message will appear:* Please take relevant medical history and refer to Anaesthetic department for assessment.

MRI safety questionnaire reminder

Please ensure that the patient fills in and signs the MRI safety questionnaire. If the patient is unable to fill in/sign off a safety questionnaire, it is the responsibility of the referring doctor to sign it on behalf of the patient.

Patient girth and MRI

Please ensure that the patient's maximum body circumference does not exceed (typically) 170 cm otherwise the patient will not fit in the MRI scanner.

Exam-specific girth and MRI (This will appear for certain exams like cervical spine/neck)

Please ensure that the [body part requested] circumference does not exceed [measurement in cm] otherwise the patient will not fit in the MRI [coil type] coil.

Maximum neck circumference = typically 45 cm

Maximum knee circumference = typically 60 cm

Maximum circumference for chest, pelvis, liver, MRCP, abdomen = typically 150 cm

MRI contrast (gadolinium) (This will appear for all examinations that require gadolinium)

The last serum creatinine level/eGFR was [x] on DD/MM/YY. (This will be automatically displayed from the results/pathology system)

Please read [RCR guidance on use of gadolinium](#) in patients who:

- Have impaired renal functions
- Are peri-operative liver transplant
- Are pregnant
- Breastfeeding.

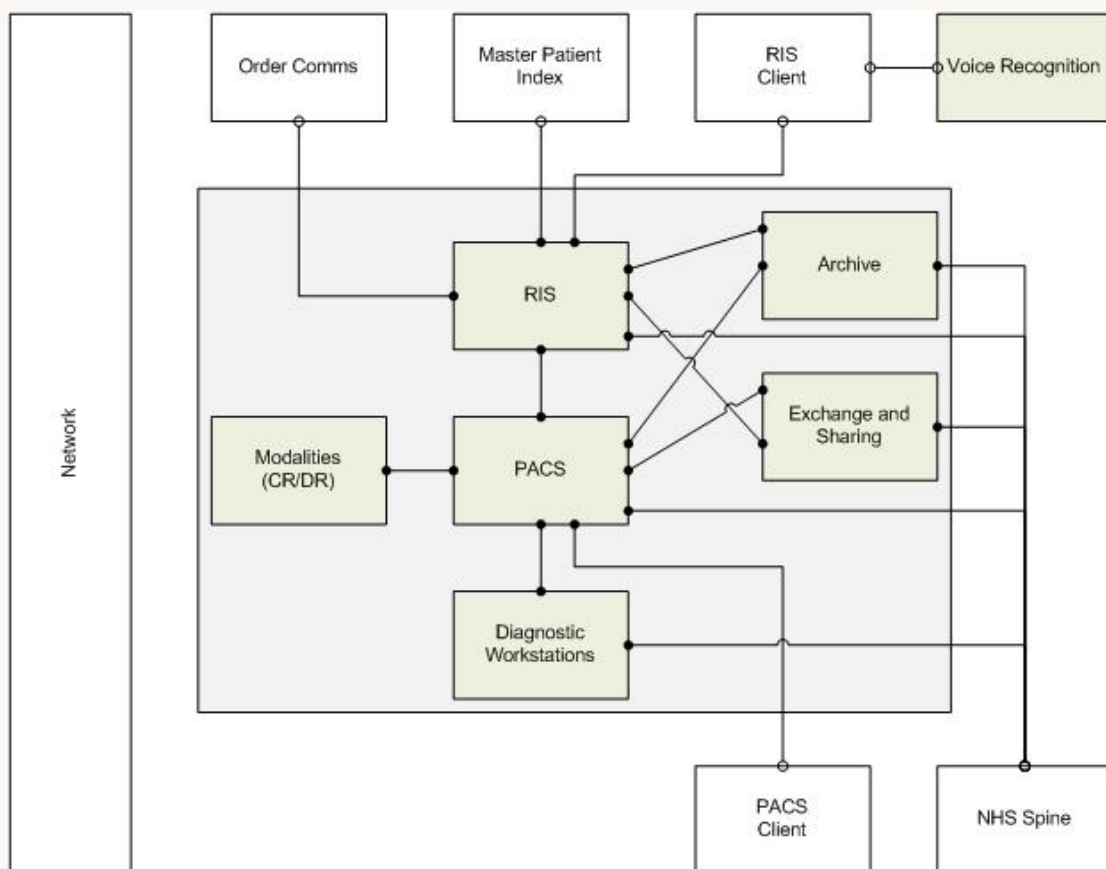
VII. Alert for exams requiring bowel preparation (eg, CT colonography)***Bowel preparation alert***

Please ensure that the patient can tolerate bowel preparation.

VIII. Reminder for exams needing consent form***Consent form reminder***

Please complete a consent form for this exam. Particular care with paediatric examination to ensure that consent is obtained from the right responsible adult

Appendix 2. Diagrammatic representation of a typical IT context for PACS and RIS in a secondary care setting and a summary of the key Integrating the Healthcare Enterprise (IHE) profile



In IHE, an electronic remote requesting system is called an 'Order Placer', and the receiving system where the request is justified and booked is called an 'Order Filler and Department System Scheduler'. In radiology the receiving system is typically a RIS, but it could be part of a larger enterprise-wide appointment scheduling system.

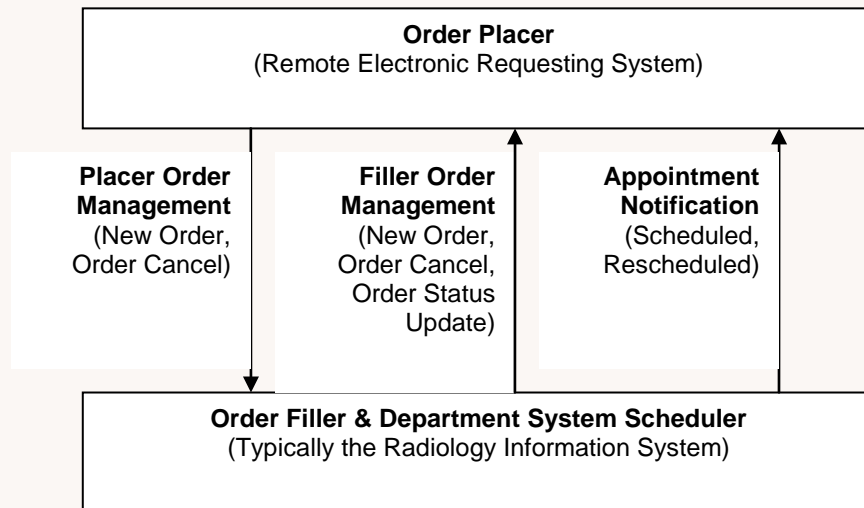
IHE has defined the following groups of HL7 transactions to support order communications within the scheduled workflow profile.

Placer Order Management transactions enable a clinician to place a new order or cancel an existing order. To change an order, the order placer system must send a message to cancel the initial order, and then place a new one.

Filler Order Management transactions are used by the radiology department system (Order Filler) to inform the electronic requesting system (Order Placer) about any new orders that have been entered independently on the radiology department system. This may be because a paper request card has been received and the details entered directly on the RIS, or the radiology department decides to book an alternative investigation to the procedure requested. Filler order management transactions also enable the radiology department system to let the requesting system know the progress of the request, by sending a message when the status of the order has changed (for example, from requested to booked, in progress,

discontinued, completed, and so on). It also informs the order placer if the order has been rejected or cancelled the department. Again, if the department needs to change an order, it has to do so as a combination of Order Cancel followed by New Order.

Appointment Notification transactions enable the radiology department system scheduler to inform the requesting system of the dates and times of any appointments relating to the requested procedures. These can reduce the number of appointment-related enquiries made to the radiology department.



IHE Scheduled Workflow Transactions for Order Communications

Appendix 3. Core requirements for synchronisation of exam status with electronic requesting (Ordercomms) systems

- Requested
- Request justified
- Request held/deferred with reason
- Scheduled or appointment given
- Cancelled with reason
- Arrived/attended
- Did not attend
- Exam started
- Exam completed
- Exam not performed, with reason
- Report dictated
- Unauthorised report
- Authorised/verified report
- Amended report
- Report viewed
- Report acknowledged
- Review requested
- Waiting status.

Appendix 4. Key elements of a consistent clinical user interface

RIS, PACS and ER must display clearly and consistently the following vital information:

- Patient demographics (name, date of birth, sex, PAS number, NHS number, address)
- Current patient location
- Current responsible consultant
- Current specialty/department
- Requesting responsible consultant.

The distinction between 'requesting' versus 'current responsible' consultant and 'requesting' versus 'current patient' location and their relevance to timely communication of results should be reflected in their consistent display and continuous synchronisation within all three systems.

In addition, RIS must be able to display request information clearly such as:

- Clinical history
- Exam description
- Suspected diagnosis flags (for example, cancer or heart disease). (Flags that may be required for national data collection as specified by the NHS Information Standards Board for Health and Social Care [ISB])
- Priority
- Requesting responsible consultant/GP
- Requesting specialty/department/GP surgery
- Requester
- Name of requester
- Grade of requester
- Contact number of requester
- Patient location at request
- Patient category
- Date of request.

Citation details

The Royal College of Radiologists. *A practical guide to implementing Ordercomms and electronic remote requesting in radiology*. London:

The Royal College of Radiologists, 2014.

Ref No. BFCR(14)1

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January 2014.

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