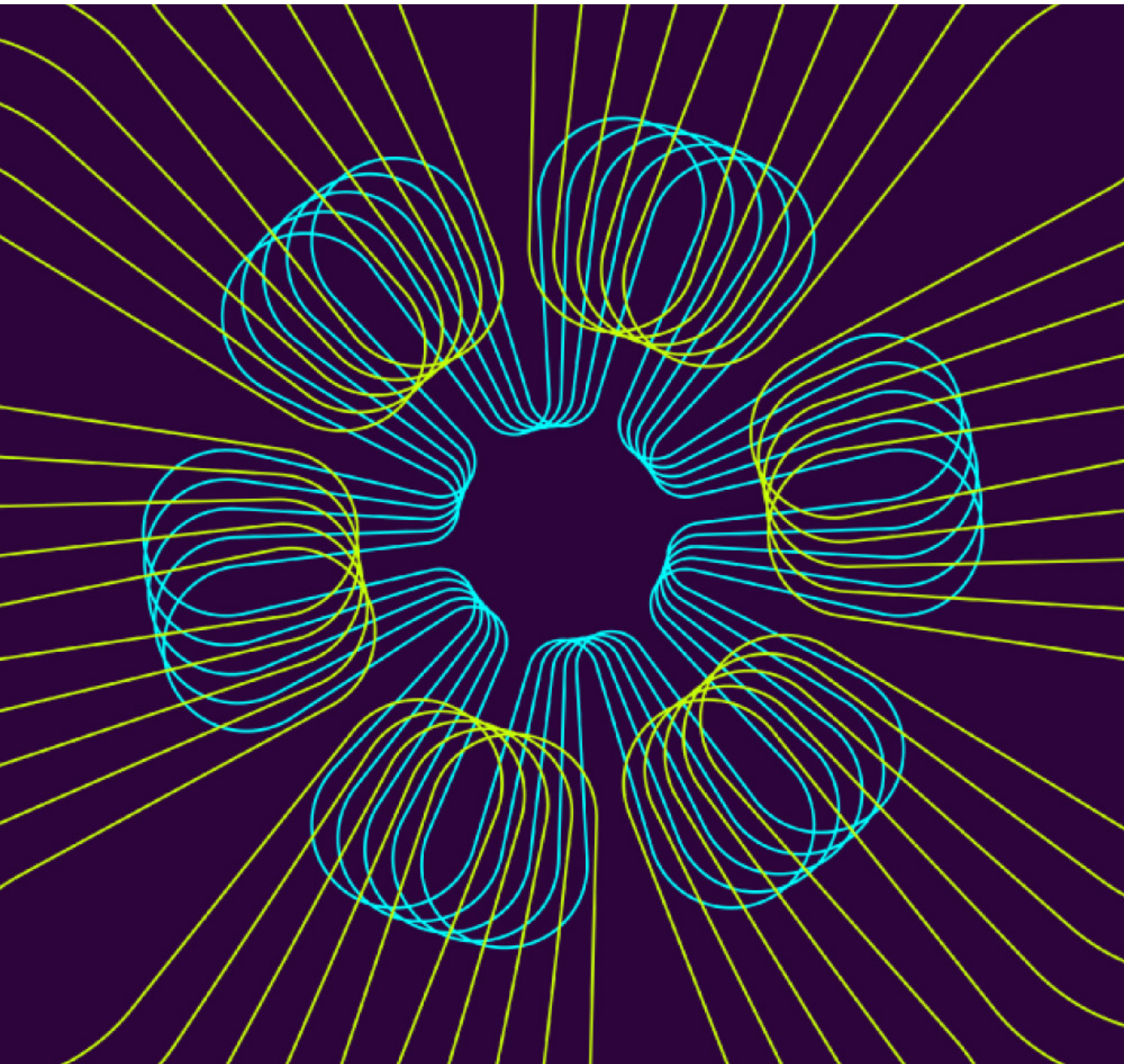
Clinical Radiology

Standards for Radiology Events and Learning Meetings (REALMs), second edition

Embracing fallibility – shaping a positive culture for thinking better and learning safely

NOVEMBER 2026

The Royal College of Radiologists



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Summary of standards

Standard	Title	Summary
1	A culture of safety, compassion and learning	Supportive, blame-free culture; visible senior leadership; agreed behavioural standards; learning from error is normalised
2	Creating protected space for shared learning	Minimum 12 hours per year; protected time; standardised structure; hybrid/virtual options; no recording; separate from governance
3	Engagement and attendance	All reporters attend ≥50% of REALM time; contribute learning cases and good spots; radiology residents actively involved; subspecialty REALMs
4	Roles and responsibilities	REALM lead(s) appointed with adequate paid time; separate from governance lead; notifier role defined; radiology resident involvement
5	Preparing cases for learning	Fully anonymised; no scoring or grading; standardised review with bias and system factor prompts; educational focus
6	Standardising and optimising communication	Standardised communications; learning summaries; attendance records; templates for consistent practice
7	REALM(AI)	Dedicated AI learning framework; human–AI interaction events; discussed locally; submitted to the RCR platform for national learning
8	Understanding why errors happen	Human factors, cognitive bias and safety science; normalise errors from complex human–system interaction
9	Reflective practice and wellbeing	Connection and peer support; group and individual reflection; documentation caution; compassion; wellbeing signposting
10	Building a REAL community through the RCR	Case submissions to the RCR learning platform; national network of REALM leads identified to the RCR REAL Faculty; annual review

Introduction

The complexity of imaging interpretation, high-volume workloads and the cognitive demands of diagnostic decision-making mean that even experienced radiologists will encounter discrepancies and interpretative errors throughout their careers.[1]

However, the published rates are remarkably stable. Real-time error in routine daily practice averages 3% to 5% of reported studies, while retrospective review of abnormal examinations identifies missed findings in approximately 30%.[2] These figures were first described more than 75 years ago by Henry Garland and have not shifted despite subspecialisation, technological advances, digital imaging and structured reporting.[3,4,5]

However, the conditions in which the work is done do affect error rates. For example, diagnostic errors are more likely when radiologists report more cases than they usually would in a day.[6] This means that errors come from the way systems are set up and the way human thinking works. They are not simply the fault of individuals.

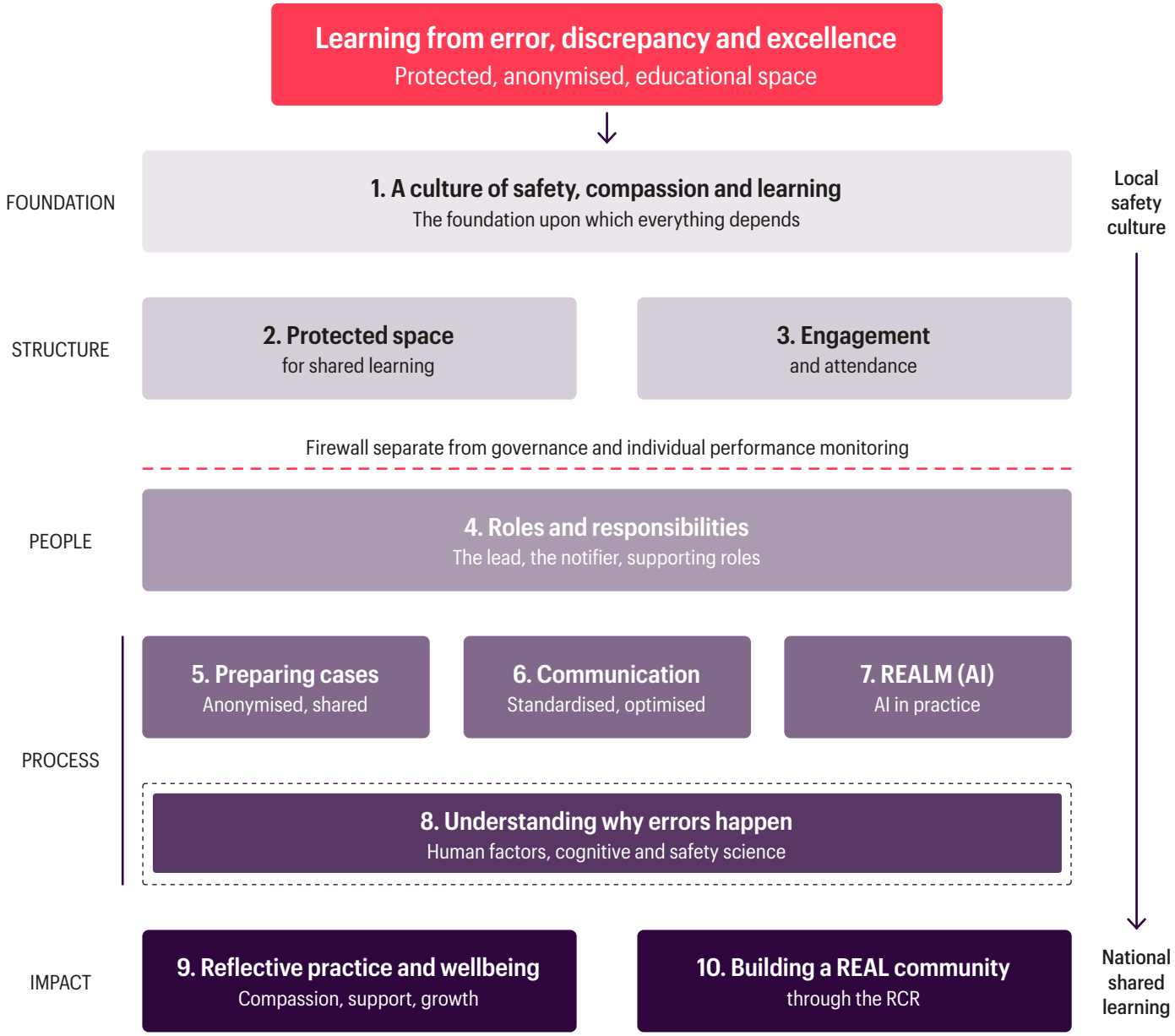
For this reason, the REALM framework is based on learning without blame, using anonymised cases discussed in a safe space. This also allows the wider organisation to learn. When cases are discussed in REALMs, recurring themes or system concerns may become clear that would not be obvious from a single case. Departments should set up a clear route for escalating these relevant themes or system failings to those who are able to act on them.

This 2026 edition of the REALM standards reflects the evolving landscape of radiology practice: the growth of remote reporting and teleradiology, the expanding multiprofessional reporting workforce and the rapid integration of artificial intelligence (AI) into clinical workflows. It draws on advances in safety science, human factors research and cognitive psychology to strengthen the educational foundations of Radiology Events and Learning (REAL), to deepen our understanding of why errors occur and to create opportunities for learning and for meaningful system improvement. Education, understanding and shared learning are inseparable and, together, they underpin the guiding principle of this edition:

Embracing fallibility – shaping a positive culture for thinking better and learning safely.

These standards apply to all individuals engaged in image reporting including consultant radiologists, specialty and specialist (SAS) doctors and trust-grade doctors, radiology residents, reporting radiographers and sonographers in all reporting settings. Clinicians outside radiology who interpret and report imaging, including cardiologists, obstetricians and gynaecologists and colleagues in acute specialties, are encouraged to apply the same principles, either through a REALM within their own specialty or by taking part in radiology REALMs, where local arrangements support this.

The REALM framework
How the 10 standards work together



Essential updates since 2020

- **Remote and hybrid working:** Home reporting has increased flexibility but reduced face-to-face interaction, limiting spontaneous learning and peer support. 41% of clinical radiology consultants now work less than full-time, the highest on record, and departmental attendance is correspondingly fragmented.[7]
- **Workforce expansion:** The number of reporting radiographers has more than doubled between 2020 and 2024.[8] All reporters must be included in the REALM process.
- **AI integration:** AI tools are now in use in 75% of radiology departments, most commonly to support image interpretation (58%) and image prioritisation (26%).[7] This introduces new categories of error, including automation bias, which has been shown to degrade the performance of even experienced readers when AI output is incorrect.[9]
- **Teleradiology:** Outsourcing now accounts for around 28% of computed tomography (CT) and 24% of magnetic resonance imaging (MRI) reporting, and roughly three in ten NHS consultants also work for teleradiology companies.[7] The workforce is blended and a consistent learning culture across different settings is essential.
- **Erosion of protected time:** Consultants have seen a 25% reduction in supporting professional activity (SPA) time over the past decade, 92% of clinical directors report insufficient time for service improvement and 98% are concerned about morale and burnout.[7] Attendance at REALMs must be protected in job plans.
- **Safety science and human factors:** There is growing recognition that diagnostic events arise from complex human–system interactions, not individual carelessness.[10,11,12]

The REALM framework

What REALM is

REALM is a protected, anonymised, educational process for shared learning from radiological events. Its purpose is to:

- Establish a culture where learning from error, discrepancy and excellence is routine and valued
- Provide a psychologically safe space for open, reflective discussion
- Improve the quality and safety of radiological practice through collective insights
- Continue to develop valuable learning resources including those based on case contributions.

What REALM is not

- Not case review – cases are discussed for educational value and not to determine outcomes or level of patient harm.
- Not a substitute for candour, patient safety incident or complaint processes – these are entirely separate.
- Not a route for individual scrutiny – cases are anonymised and discussion is never attributed to individuals involved.
- Not performance management – REALM must never be used to assess individual competence.

How to use these standards

These standards describe a framework for how REALM should operate in every organisation. REALM is not optional and participation is a professional obligation for all reporters. Organisations are responsible for providing the protected time and support that participation requires. The terms below indicate the strength of each requirement.

- **Must:** An essential requirement that applies in all settings.
- **Should:** The expected standard of practice. Variation is acceptable only where a specific local constraint prevents it. The reason must be documented, mitigations put in place and the position reviewed as part of the annual REALM review. Preference or convenience is not justification.
- **May or consider:** A matter of local choice, used only for how a requirement is delivered, such as meeting format or frequency. It is not used for whether reporters or departments engage with REALM.

The firewall principle

REALM must remain separate from all governance, investigative, regulatory and performance management processes, and its records must not be used in any such processes. Requests for REALM records should be declined and redirected to the organisation's governance process (see Appendix 5 FAQ). This separation helps build psychological safety: the confidence that people can speak openly about mistakes without fear of blame.[13] It also reflects what Sidney Dekker describes as a just culture, in which people report openly because they trust that what they share will be used for learning and handled fairly.[14]

The principle mirrors the statutory 'safe space' for national patient safety investigations carried out by the Health Services Safety Investigations Body[15] although REALM has no equivalent legal protection. REALM cases are anonymised at source and may be combined or adapted to protect anonymity and optimise learning opportunity. Meeting records should hold only anonymised learning material, and system themes and should not identity the reporter, notifier or patient. Any formal request for case information, including a lawful request, should be directed to the organisation's governance process, where the case should already have been escalated and where an identifiable record is held and reviewed in the appropriate setting.

Within an organisation, REALM complements the organisation's responsibilities under the Patient Safety Incident Response Framework (PSIRF) but does not replace them.[16] The same event may be reviewed in parallel through patient safety incident response, complaint or candour processes, which hold their own identifiable records under their own regulations. Escalation of individual cases rests with the notifier (see Standard 4).

In addition to anonymised, shared learning in the meeting itself, REALM further contributes to patient safety in two ways: through the pre-agreed escalation of themes and system failings, which may inform PSIRF learning responses (see Standard 2), and where the REALM lead becomes aware that a case that requires governance input has not been escalated (see Standard 4). Neither requires the reporter to be identified.

01 Standard 1: A culture of safety, compassion and learning

Good doctors … do what they can to help create civil and compassionate cultures where all staff can ask questions, talk about errors and raise concerns safely.

– GMC, *Good medical practice*, Domain 3[17]

REALM must operate within a culture of compassionate leadership, psychological safety and explicitly agreed behavioural standards, with visible and active support from senior leadership at every level.

Key requirements

- Meetings must be conducted in a blame-free, non-judgemental environment where learning from errors and challenging cases is normalised and valued.
- Behavioural expectations should be explicitly stated and reinforced at each meeting (see Appendix 2):
  - Respectful and supportive language at all times
  - No identification of individuals, directly or by implication
  - No corridor conversations or informal attribution after the meeting
  - Active listening, curiosity and constructive dialogue
  - Acknowledgement that errors are inevitable for all radiologists and reporters due to the complexity of the work.
- Compassionate leadership from the REALM lead and senior clinicians, who should model fallibility by engaging with learning from anonymised cases. Anonymity is maintained for all cases without exception, including those involving the lead or senior clinicians. Self-identification is discouraged, whether offered as role modelling or as explanation, because it shifts attention from the learning to the individual and invites justification. The aim is to normalise the conversations around error as a routine part of practice and quality improvement.

01
Culture

Organisational accountability

Organisational culture is shaped by the worst behaviour leadership is willing to tolerate.

– Gruenert and Whitaker, *School culture rewired: how to define, assess, and transform it*[18]

- Senior leadership accountability with clinical directors, medical directors and trust leadership actively endorsing REALM and visibly upholding its values is essential for the success of REALM.
- Any behaviour undermining psychological safety (eg intimidation, public criticism, humiliation) must be addressed promptly and escalated where necessary.
- REALM should be embedded with Civility Saves Lives principles and the General Medical Council (GMC) requirement to treat colleagues with kindness, courtesy and respect.[17]
- REALM leads should seek periodic anonymous feedback on REALM culture in their organisations and have the support of leaders and managers to act on results.

02 Standard 2: Creating protected space for shared learning

Psychological safety is a shared belief held by members of a team that the team is safe for interpersonal risk-taking.

– AC Edmondson, Psychological safety and learning behavior in work teams[19]

A minimum of 12 hours of REALMs per year should be held by each department. Meetings should be structured, time-protected, adequately resourced and never recorded.

Key requirements

- Protected REALM discussion time of a minimum of 12 hours per year is recommended, with all reporters attending a minimum of 6 hours.
- There should be a minimum of six meetings per year, with local flexibility for frequent, shorter sessions or fewer, longer sessions.
- Meetings should be timetabled and protected from service pressures.
- Hybrid or virtual attendance options should be available. Virtual facilitation requires intentional effort for inclusivity.
- Given the sensitivities around many cases, REALMs must not be recorded as it may affect trust and openness in discussion.
- Learning summaries may support retrospective reflection but should not substitute for live attendance.
- Meeting days and times should be rotated to enable broad participation.
- REALMs should involve all reporters – consultant radiologists, SAS and trust-grade doctors, radiology residents, reporting radiographers and sonographers.
- In some special interest settings, non-radiologist clinicians report imaging directly. Their inclusion should be at the REALM lead's discretion. Their perspectives can enhance learning by offering patient-facing insights, broadening understanding of report context and helping radiologists refine reports to better meet clinical needs. When clinicians do join, they must maintain the REALM core principles of anonymity and learning focus.
- Inclusion beyond the reporting body should never compromise psychological safety.[20] Broader REALM attendance to include non-clinical managers is therefore not recommended.
- Special interest REALMs (eg paediatric, breast, nuclear medicine, interventional) may run alongside the main REALM.
- Interventional radiology cases can be discussed usefully at general REALMs, particularly where there is diagnostic or system learning. Morbidity and mortality meetings, however, continue to have a distinct role in reviewing procedural outcomes within clinical governance and fall outside the scope of these standards.[21]

02
Protected space

- AI REALM cases should be included in general REALMs, and separate meetings may be set up where the volume of AI cases is higher.
- Relevant themes or lessons from special interest REALMs should feed via the REALM lead into general REALMs to promote shared learning where appropriate.
- Dedicated reporting radiographer and resident REALMs may offer additional supportive environments among peer groups in parallel with the general REALMs, using the same core principles outlined in these standards.
- REALMs may be aligned with, but must never be replaced by, non-anonymised interesting case or peer review meetings.

Suggested meeting structure

1. Welcome, ground rules and psychological safety reminder (see Appendix 2).
2. Brief teaching topic – related to cognitive bias or human factors, or local subject matter expert (SME) for targeted teaching, or an invited external speaker.
3. Case discussions – reflecting on cases or themes deemed to have educational value.
4. AI learning cases (where applicable).
5. Identification of any system-level concerns for safe escalation.

Separation from governance

REALMs are not investigatory meetings. They are distinct from all investigatory, governance, disciplinary, legal and coronial processes. They are not used to assign blame, scrutinise cases to determine harm or provide feedback for patient safety incident responses. Case reviews for such purposes must be conducted through appropriate non-anonymised mechanisms such as candour or governance-led review panels, depending on organisational policy. (See FAQ, Appendix 5)

Individual performance monitoring has no place in REALMs. They should never be used to track, monitor or report individual error rates, performance metrics or patterns of discrepancy attributable to named reporters in any reporting settings. Individual error rate monitoring is a governance function and must remain entirely separate from the educational REALM process.

Learning from system failings

Every system is perfectly designed to get the results it gets.

– Paul Batalden, *Like magic? Every system is perfectly designed*[22]

Most diagnostic events arise from complex interactions between people, processes and environments.[2,10]

Every department relies on adaptations: steps that are shortened, workarounds that are found and rota gaps that are not always covered. These are the difference between how work is imagined and how it is actually done.[23] Because these adaptations usually succeed, they become accepted practice and stop being questioned. REALM provides an opportunity to identify them.

02

Protected space

Discussing cases together allows patterns to be recognised and the hidden, systemic flaws built into our workflows and environments (the so-called latent conditions) to be identified before harm occurs.[10] It also allows the department to ask whether there is a better way.

When system-level vulnerabilities are identified (eg communication failures, IT constraints, unsafe working conditions), the system issue should be escalated to governance teams or departmental leadership as per local agreement, where they may inform PSIRF learning responses.[16] This is not a breach of REALM standards and this mechanism protects anonymity and no-blame learning while ensuring safety-focused learning at an organisational level.[24]

This approach is similar to the way aviation learns from incidents.[25] Aircraft carry a 'black box' that records what happens during a flight. When something goes wrong, the recording is studied to understand what happened and why, and the lessons are shared across the industry so that others can prevent recurrence. Surgery has adopted a similar idea through the Operating Room Black Box, which records events during operations so that teams can review them and improve safety.[26] REALM brings the same approach to radiology reporting. It captures near misses and weaknesses in the system so that everyone can learn from them and services can improve.

The systems escalation pathway should:

- Be clearly documented and agreed in advance with departmental leadership
- Focus exclusively on system, process or resource issues, not individual performance
- Be communicated transparently to REALM participants
- Ensure confidentiality and aim to maintain psychological safety.

In summary: Escalating system-level concerns enhances, rather than undermines, the value of REALM. It supports a learning culture aligned with these standards. The process must remain focused on anonymous system improvement.[16,17]

03 Standard 3: Engagement and attendance

Everyone in healthcare really has two jobs when they come to work every day: to do their work and to improve it.

– Batalden and Davidoff, What is 'quality improvement' and how can it transform healthcare?[27]

All consultants, radiology residents and SAS doctors should attend a minimum of 50% of departmental REALM time, actively contribute cases and participate in meeting discussions.

Key requirements

- All consultant radiologists, SAS and trust-grade doctors, radiology residents, reporting radiographers and sonographers are expected to engage with REALMs and this should be considered an appropriate SPA within their job plan.
- Consultants and SAS doctors should attend at least 50% of the total REALM time (at least 6 of minimum 12 hours per year).
- Face-to-face attendance facilitates attendance registration. In hybrid or remote settings, however, individuals must take personal responsibility for recording their attendance for their own appraisal records.
- Every reporter should be encouraged to submit at least one learning case per year to their local meeting with suggested learning points, providing appropriate levels of detail (submission and reflection should be recorded as part of annual appraisal).
- Radiology residents should be supported in attending general and special interest REALMs, documenting attendance for their portfolio and annual review of competence progression (ARCP).
- Reporting radiographers and sonographers should refer to the Society and College of Radiographers for continuing professional development (CPD) expectations.
- Non-radiologist reporting clinicians should be encouraged to contribute relevant cases and attend REALMs where appropriate, especially in settings where their reporting is integral to the imaging pathway. Their participation enhances learning for both radiology and clinical teams, strengthens interdisciplinary working and diagnostic pathways and could potentially include clinical feedback.
- Special interest groups can be contacted before REALMs with specific cases or themes to enhance meeting discussion quality and benefit from local expertise, in addition to and ideally following spontaneous discussions with other attendees. For example, a lung cancer patient with several unidentified bone metastases on CT staging undergoing a PET-CT that would not necessarily be indicated, depending on the number of bone lesions. To offer a preview of the case to a chest radiologist or team ahead of the meeting can prompt more depth to that discussion with wider learning and a better understanding of imaging criteria in lung cancer through local expertise.
- Local acknowledgement schemes (see Appendix 3) should confirm the time and content of the meeting, making clear it is suitable for contributing to an individual's CPD.

04 Standard 4: Roles and responsibilities

You must … take active steps to create an environment in which people can talk about errors and concerns safely.

– GMC, *Good medical practice*,[17] for those in leadership roles

The REALM lead should be an appointed consultant radiologist, specialist or associate specialist with dedicated time, training and clear separation from governance roles. The notifier role should be clearly defined and supported.

Separation of roles

The REALM lead should not also hold a clinical governance, patient safety or clinical lead role. Combining these roles creates a conflict of interest that can undermine trust and psychological safety. Reporters may fear that cases shared at REALMs could be used against them and become less willing to speak up. Keeping the REALM and governance pathways separate protects reporters and supports a genuine learning culture.[13]

Other considerations

- The seniority requirement reflects the need to convene consultant colleagues as peers.
- The REALM lead (or co-leads) should be appointed through a transparent process. The role should be recognised in the job plan, with time that reflects the work involved: managing case notifications, liaising with notifiers, checking that escalation, addenda and communication with the primary reporter have taken place, preparing cases, chairing meetings, circulating learning points and escalating system concerns.
- As a guide, a general REALM in a busy department with a single lead may need 1 PA per week in order to fulfil the lead role, shared between co-leads where there are two. A smaller special interest REALM with fewer reporters and cases may need less, but no less than 0.5 PA.
- Each organisation should decide which REALMs it needs, such as a single general meeting or separate special interest meetings (eg paediatrics, breast, cardiothoracic or nuclear medicine). Time should be agreed locally and shared fairly according to demand. Keeping a simple log of time spent over a few months gives a realistic basis for this agreement.
- The lead is required to create the conditions in which knowledge is shared safely among participants and to manage the boundary with clinical governance.
- The role is largely one of facilitation and the REALM lead should be supported in development of facilitation skills and human factors awareness and psychological safety principles.

04
Roles and responsibilities

- The REALM lead may be supported by a radiology resident or reporting radiographer.
- Dedicated administrative support is strongly recommended for case submission, meeting coordination, anonymisation, communication and documentation.
- Separate reporting radiographer or resident REALMs are an optional local addition and should operate within the same REALM principles and framework.

Core responsibilities of the REALM lead

- Establishing processes for receiving, reviewing and anonymising case submissions.
- Chairing meetings – setting the tone for respectful, blame-free discussion, monitoring group dynamics, encouraging balanced participation and redirecting inappropriate commentary.
- Capturing and disseminating learning points for all cases after the meeting.
- Escalating system-level concerns to leadership or governance teams as per local agreement, without breaching anonymity (see 'Learning from system failings' in Standard 2).
- Maintaining records of case types and themes for targeted teaching and annual review.
- Encouraging respectful dialogue outside meetings and actively discouraging post-meeting speculation about cases.

The role of notifier

The notifier is typically the reporter who identifies a discrepancy, error, good spot or potential educational case on review of a previously reported study – whether during follow-up reporting, multidisciplinary team (MDT) preparation or second opinion review. To encourage notification, the process must feel safe, simple and supported.

(a) Submitting to REALM

- Submit the case using the department's agreed method (eg standardised form, picture archiving and communication system [PACS] chat, internal or other accepted email) with suggested learning points.
- The process must remain simple and proportionate as laborious forms discourage submissions.
- Anonymisation is the REALM lead's responsibility.

(b) Informing the primary reporter

- Notifiers should provide respectful peer-to-peer feedback directly to the primary reporter, by conversation, phone, PACS chat or internal/accepted email. (See Standard 6 and template communication in Appendix 3)
- Some notifiers find this uncomfortable. However, when direct feedback becomes established practice, it normalises this communication, builds trust and strengthens working relationships.
- In cross-site or teleradiology settings, local agreement on approach is encouraged. If direct contact is not feasible, the REALM or governance lead can facilitate communication with the primary reporter.

04
Roles and responsibilities

- If the primary reporter has left the trust (eg locum, radiology resident, retirement), reasonable attempts should be made to notify them with sensitivity, offering an opportunity for discussion and support.
- Shared communications (eg a single email to notifier, primary reporter and referring clinician) can unintentionally expose or distress the primary reporter and this approach is generally discouraged unless locally agreed with sensitivity safeguards.

(c) Addenda and clinical communication

- The notifier should help initiate or agree an addendum collaboratively and promptly.
- The referring clinician must be informed if patient care is affected.
- Some electronic patient record (EPR) systems allow immediate patient access to addended reports – prompt communication with the referring clinician is essential.

(d) Governance escalation and duty of candour

- REALM is not defined by harm, and the absence of harm is not a reason to avoid governance escalation. A near miss is an opportunity to learn before harm occurs.
- Whether a case should be escalated through governance is determined by local policy, not by individual judgement, or the outcome in a case or a wish to 'protect' oneself or colleagues.
- Statutory duties of candour, which vary across the UK, are triggered by incidents involving a defined threshold of harm. Professional duty of candour, however, is broader: it requires openness when things go wrong and includes reporting near misses to support learning.[28] REALM shares this broader view, and near misses and examples of excellence are also seen as valuable learning.
- REALM protects the identity of individuals within the learning process but case submission does not exempt notifiers from governance escalation responsibilities. They must ensure the referring clinician is informed and appropriate escalation has occurred for consideration in parallel through governance processes.
- If in doubt, consult the clinical governance lead without delaying escalation.
- If the REALM lead becomes aware that a particular case has not been escalated where indicated, the lead will ask the notifier to do so. If this does not happen within a reasonable time frame, or the risk is immediate, the REALM lead will escalate directly to the clinical governance lead.

The role of radiology residents

- Radiology residents should be encouraged to support the REALM lead in case collation, anonymisation, presentation preparation and submission to the RCR learning platform.
- This offers valuable educational and leadership development experience.
- The REALM lead retains overall responsibility for quality, safety and culture.

05 Standard 5: Preparing cases for learning

Errors should be understood as arising from system vulnerabilities, not solely from individual failings. The focus must be on learning, not blame.

– Adapted from WHO, *Patient safety curriculum*[29]

Cases must be fully anonymised, discussed in a safe educational environment and never scored or graded.

Key requirements

Anonymisation

- All patient-identifiable information must be removed before presentation.
- PACS anonymisation may be incomplete – look out for embedded demographics and reports and screen captures.
- Reporter identity must not be disclosed directly or by implication.
- Outsourced or externally reported cases may be discussed where anonymity is maintained.
- Named recognition for good spots is optional and only with explicit consent.

Case preparation

- REALM lead should prepare cases using a locally agreed format (eg PACS, PACSbin, PowerPoint), ensuring alignment with the organisation's local information governance policy.
- Keeping information close to original reporting conditions can provide context, including any typographical errors or abbreviations, and can help set the scene.
- Alternatively, cases may be batched to illustrate a theme, blended or adapted, particularly where there are particularly sensitive or identifiable cases.
- Learning often comes from communications in relation to a case as well as interpretation or processes such as vetting, protocolling and report escalation through established notification pathways.

05
Preparing cases

Standardised case review

- REALM must never assign error scores, levels of discrepancy or subjective judgements.
- Human factors and cognitive bias prompts may enhance discussion and learning where applicable (see Standard 8 and Appendix 4).
- What can we learn? Identify key educational points.
- Is there a system concern to escalate?

Theming and educational value

The REALM lead should aim for a balanced mix of cases reflecting the department's range of work. Grouping cases by special interest or theme (eg communication issues, specific pitfalls) can enhance efficiency. Some cases may be briefly summarised rather than shown in full, especially where they highlight common patterns, and education must remain the focus.

06 Standard 6: Standardising and optimising communication

You must … communicate clearly, politely and considerately … recognise and show respect for colleagues' skills and contributions.

– GMC, *Good medical practice*, para 49[17]

REALM should standardise communication to ensure consistent, respectful and effective practice across the process.

Key requirements

- **Acknowledgement of submissions:** The REALM lead (or administrator) should send a prompt, courteous acknowledgement to the notifier, confirming receipt and reminding them of their responsibilities (see Appendix 3).
- **Notification to primary reporter:** The notifier should inform the primary reporter at the time of submission, as a professional courtesy and to normalise discussion of learning cases (see Appendix 3, Template 2a). If this has not happened within a reasonable time frame the REALM lead will make contact instead (see Template 2b), although this should be the exception. The REALM may take place some time later with no specific notice of the meeting date routinely sent to the primary reporter. Departments may choose to offer further communication locally and any reporter can ask the REALM lead when a case they have been involved in will be discussed.
- **Post-meeting learning summary:** Key learning points from each meeting should be summarised and disseminated to all department reporters, including those unable to attend. All case details must remain anonymised.
- **Administrative support** is invaluable for case management, meeting invitations and circulation of learning outputs.
- **Attendance records:** The REALM lead can oversee attendance records at face-to-face meetings, but in hybrid or remote settings individuals are responsible for recording their own attendance for appraisal.
- **Annual review:** Once a year, the REALM lead should prepare a short summary of the year's meetings. This gives participants the chance to look back on the year, see the themes that have emerged and help shape future meetings. The summary should contain no case identifiers. It might include:
  - The number of meetings held
  - The number and type of cases discussed
  - Recurring themes, such as cognitive biases or human factors
  - System issues identified and escalated
  - Examples of good spots
  - Feedback from participants.

The summary is for REALM participants and could be presented at a REALM.

Templates for all key communications are provided in Appendix 3.

07 Standard 7: REALM (AI) – learning from AI in practice

The real question is not whether machines think but whether [people] do.

– BF Skinner, *Contingencies of reinforcement*[30]

REALM should include an AI-related learning component to capture and share learning from human–AI interactions. Detailed implementation guidance is provided in Annex A: REALM(AI) framework.

AI cases are discussed at REALMs for their educational value only. Discussion is not an assessment of the performance of an AI tool or judgement of whether a reporter has acted appropriately. Many reporters are new to AI or work in departments yet to adopt it. Learning cases help all reporters understand how AI tools behave in practice, including their known limitations.

Key requirements

- Every department using AI should have an appointed clinical radiology AI lead.
- Where AI tools are in use, departments may hold a dedicated AI section within REALMs or periodic AI-focused meetings and should consider inviting the clinical radiology AI lead. REALM discussion should focus on how reporters work with AI, not on the performance of the AI tool in isolation, which is the remit of AI governance.
- AI-related learning events for discussion at REALMs should be selected for their educational value using the standard REALM format with additional AI-specific discussion.
- Cases that show a tool behaving within its documented limitations, such as a normal variant flagged as abnormal, can have particular educational value and may be shared as learning cases.
- AI learning cases should also be submitted to REAL(AI) resources on the RCR learning platform for national sharing.

07
REALM (AI)

Event classification

AI event type	Description
Automation bias	Over-reliance on AI, leading to reduced independent judgement[9,31]
Omission error	The AI tool does not highlight a finding and the reporter does not identify it
Commission error	The reporter accepts an AI output that is later found to be incorrect
Algorithmic aversion	The reporter does not accept an AI output that is later found to be correct
Automation complacency	Checking of AI output becomes less thorough over time because the tool is usually right[32]
AI-assisted detection	The AI tool highlights a relevant finding that may otherwise have been missed
AI factors	Conditions in the design or use of an AI system that make an error more likely, independent of the reporter's skill or judgement

These terms describe what can happen and will support discussion and learning. It is not about blame and the terms are not judgements of clinical performance, but they simply represent phenomena observed when human operators interface with automated systems.[33] More than one term may apply to a single case. Annex A explains each term in more detail.

Principles for safe use of AI

- AI serves as a clinical support tool, not a replacement for radiological judgement, ensuring the 'human in the loop' retains ultimate diagnostic responsibility.[34]
- When an AI output and the reporter's interpretation differ, the correct answer, the so-called 'ground truth', is not always known at the time of reporting. Neither should be assumed to be correct, and this discrepancy should prompt careful review.
- Reporters should follow standard procedures, including comparing with previous imaging and taking into account the clinical details, which current AI tools often cannot do.
- Reporters should understand the limitations of the AI tools they use, particularly common overcalls and undercalls, and should critically appraise AI outputs rather than accept them at face value.[35]

Reporting AI errors

- Concerns about the performance of an AI tool identified through REALMs should be passed to the clinical radiology AI lead.
- Significant AI errors (unexpected misses or misinterpretations) should be reported to the clinical radiology AI lead, the clinical safety officer and the AI vendor.
- Consider using the Medicines and Healthcare products Regulatory Agency (MHRA) Yellow Card scheme (see Annex A).

08 Standard 8: Understanding why errors happen – human factors, cognitive bias and safety science

We cannot change the human condition, but we can change the conditions under which humans work.

– James Reason, Human error: models and management[10]

REALM should embed human factors thinking, cognitive bias awareness and safety science into its learning culture as the standard way of understanding radiology events.

Key requirements

- Radiology events rarely result from individual carelessness. They arise from the interaction between the reporter's thinking, the conditions at the time and the system in which the work took place.[10,11] REALM should consider all three.
- Whenever a bias is identified, the discussion should go on to ask what made it more likely and what would make it less likely. Naming a bias without asking these questions can feel like blame and the learning is lost.
- Biases affect every reporter, however experienced. Discussion should make it clear that recognising a bias is a normal part of learning and that understanding it helps reporters adapt their practice and helps departments improve working conditions.
- Short teaching sessions on human factors and cognitive bias should be a regular part of REALMs. These can cover biases relevant to radiology (see Appendix 4) and the working conditions that make them more likely, illustrated with cases from the REALM.
- The REALM lead should develop or access resources to support this teaching. The RCR REAL Faculty and the RCR learning platform will provide centrally developed materials.
- System-level concerns identified through case discussion should be escalated through the locally agreed process (see Standard 2).
- Understanding cognitive bias becomes more important as AI tools enter the workflow and introduce new forms of bias (see Standard 7).

09 Standard 9: Reflective practice and wellbeing

Reflecting on experiences, positive or negative, supports professional development, improves care quality and strengthens resilience.

– Adapted from *The reflective practitioner*[36]

REALM should support both group and individual reflective practice, promote compassion for oneself and for colleagues and provide all reporters with clear signposting to wellbeing support.

Why this standard matters

Radiology is among the specialties most affected by burnout, with overall prevalence estimates ranging from 33% to 88%.[37,38] The 2025 RCR census confirms the scale of the problem in the UK: 98% of clinical directors are concerned about morale, stress and burnout in their departments. Consultants are leaving the NHS early: the median age of leavers is now 50 and 77% are under 60. SAS radiologists leave earlier still, with a median age of 37. Consultants have lost a quarter of their SPA time over the past decade, and 92% of clinical directors report insufficient time for service improvement.[7] Reflection is being asked of a workforce with less time and less stability than when these standards were first written.

Professional isolation is a significant driver. PACS has reduced face-to-face contact with clinical teams, and the growth of remote and outsourced reporting has compounded this.

Making an error can affect individuals deeply. Reporters may feel shame, guilt, anxiety or a loss of confidence and it can impact how they see themselves as professionals.[39,40] For some, these feelings last for years and may lead them to step back from practice or leave clinical work altogether.[41] These effects can be made worse by a professional culture of perfectionism, reinforced by public expectation, which makes errors difficult to acknowledge or discuss openly. Clinicians may then deal with the aftermath in isolation, and learning that could have been shared with colleagues is lost.[42] Burnout and distress after an error also make further errors more likely, which creates a cycle that puts patients at risk.[43]

Connection is protective. Peer support is consistently the most effective route to recovery after an adverse event.[44,45] Structured programmes such as RISE (Resilience In Stressful Events) at Johns Hopkins, with trained peer responders available 24/7, have been shown to be both effective and cost-saving through improved staff retention.[46] Compassion is key: from colleagues, it takes the form of peer support; from oneself, it is the recognition that error is part of professional growth and not a sign of weakness.[47,48]

REALM is built on psychological safety and shared learning.[13] It brings reporters together to learn from one another and treats supporting them as integral to patient safety as well as a moral obligation. The REALM lead should be able to signpost individuals to available support (see Appendix 1) and support should be accessible across all reporting settings.

09
Reflective practice

REALM as a forum for reflective practice

The REAL framework supports individual and collective reflection, following the stages of well-established reflective models, such as Gibbs' reflective cycle[49] and Kolb's experiential learning cycle:[50] what happened, how it felt, why it happened and what could be done differently. Working through these stages turns an individual experience into shared learning. When reflection becomes a normal part of practice, errors can be discussed as opportunities to learn, which in turn supports psychological safety within the team.[13]

The emotional impact of error also needs acknowledgement, beyond REALM case discussion. Many trusts already provide established forums that can meet this need.

- **Schwartz rounds** offer all staff a regular forum to share the emotional impact of their work, without seeking to solve problems.
- **Balint groups** help clinicians explore their relationships with patients and the feelings these raise.
- **Peer support schemes** provide one-to-one or small-group support after difficult events.

Departments should find out what is available locally and make sure that staff know how to access it. Where nothing suitable exists, departments should consider how this support could be provided, either within the department or through trust or organisational services.

Documenting individual reflection

Participating reporters should be encouraged to record private reflective notes for appraisal and professional development. Reflection is valued by the GMC and is not a source of risk when following appropriate guidance.

- Reflective notes are for personal learning. They should not be the record of the facts of a case; those belong in the clinical record and governance systems.
- Keep notes focused on what was learned.[36]

Concern about reflective writing followed the case of Dr Bawa-Garba. Her reflections were not used in evidence and the GMC has since confirmed it will not ask doctors for their reflective notes when investigating concerns.[21,36,51]

In summary: Reflect thoughtfully, document carefully and adhere to guidance from governing bodies to protect both patient confidentiality and professional integrity.

Please see Appendix 1: Support and wellbeing resources.

10 Standard 10: Building a REAL community through the RCR

A promise to learn – a commitment to act.

– DM Berwick, The Berwick Report[24]

The REALM lead for each department should be identified to the RCR REAL Faculty to build a national network focused on learning from error, sharing innovation and contributing to a collective learning resource.

Key requirements

- Each REALM lead should be registered with the RCR for the REAL Lead Directory to support national networking and promote good REALM practice.
- Future RCR learning events should include liaison with REALM leads, with the aim of sharing ideas, innovations and promoting excellence.
- Each department should aim to submit at least four cases per year to the RCR learning platform. These might be challenging cases, good spots or AI-related cases from their local REALMs.
- Radiology residents are encouraged to take a lead role in preparing and submitting cases under the supervision of the REALM lead.
- The purpose of national submission is to continue to build a shared learning resource accessible to all RCR members, enabling the whole community to learn rather than individual departments repeating the same mistakes. Information on CPD can be found on the RCR website.

Teleradiology and REALM

Teleradiology is now a well-established component of UK diagnostic services. Increasing engagement has raised concerns about a 'them and us' mentality when internal reporters view external errors as separate. This is a missed opportunity for learning. A substantial number of NHS consultants now report for teleradiology companies, blending the workforce. All reporters, NHS or remote, need access to a unified, psychologically safe learning framework.[21]

- Teleradiology providers should hold their own REALMs, following these standards. The same principles of anonymity, culture and governance separation apply regardless of setting.

10

A REAL community

- The primary reporter should be informed of a learning case in the standard way. Where a trust seeks assurance, the provider can confirm that feedback to the individual has taken place, which offers equity between NHS and remote reporters without disclosing case detail.
- The same REALM principles apply, whatever the setting. REALMs do not grade or score discrepancies or errors.
- Error rate monitoring of individual reporters is a governance and contractual function. REALMs should not be used for this purpose and REALM material should not be tabulated or returned to trusts as individual error data.

Annex A: REALM(AI) framework

Introduction and scope

This annex supports Standard 7. It is written for all reporters, including those new to AI and those in departments who are yet to adopt it. Its purpose is to help departments start conversations about how reporters work with AI and to share what is learned.

AI learning cases are discussed in REALMs for their educational value only. REALMs do not assess the performance of AI tools and do not replace (although may inform) AI governance frameworks including:

- Post-deployment monitoring of AI medical imaging devices[52]
- AI deployment fundamentals for medical imaging[34]
- Integrating image analysis artificial intelligence with radiology reporting workflows (RIS and PACS), second edition[53]

As the potential uses of AI in healthcare continue to evolve rapidly, this guidance is not exhaustive. It does not yet cover generative AI, such as large language models used to assist with report writing. The separate but parallel issues relating to liability are addressed in the RCR AI regulation position statement.[54]

AI as a medical device

AI tools in radiology are regulated as medical devices and are subject to regulatory oversight. For REALMs, the most relevant parts of that process are a standard operating procedure for each AI tool, setting out its intended use and known limitations, and training for all reporters before clinical use. Knowing a tool's limitations is the starting point for learning from it.

Working with the clinical radiology AI lead

Every department using AI should have an appointed clinical radiology AI lead. This individual should work with the REALM lead to bring AI learning cases to REALMs. They should also attend REALMs where possible and help reporters understand how AI can contribute to error. Concerns about the performance of an AI tool should be passed to the clinical radiology AI lead and handled through existing AI governance, including feedback to the vendor and safety reporting through the MHRA Yellow Card scheme, as appropriate.

Understanding AI learning cases

AI events shared through REALMs may be classified using the categories in Standard 7. The aim is not to score or assign blame but to improve understanding, standardise language and learn the limits of AI tools in radiology reporting. These categories are not mutually exclusive and more than one may apply to a single event.

The interaction between humans and AI (human–AI factors) include the following human factors that have been identified for automated systems more generally.

Automation bias is over-reliance on the AI system, leading to reduced independent judgement. Acceptance of an AI output may even occur despite contradictory evidence being present. This can take two forms: omission errors (the reporter does not identify a finding where the AI tool does not highlight it) and commission errors (the reporter accepts an AI output that is later found to be incorrect).

Automation bias is more likely when:

- The reporter is working outside their usual area of practice
- The tool's intended use and limitations are not well understood
- Trust in the tool is higher than its performance supports or confidence in one's own ability is low.

Algorithmic aversion occurs when the reporter discounts the AI output, including when the algorithm is correct (the opposite of automation bias). This phenomenon may be especially prominent where there have been prior negative interactions with a particular AI tool. This may be associated with the following:

Performance and trust issues

- High AI false positive rates leading to rapid under-trust and subsequent user dismissal.[55]
- Stereotyped errors made by a particular AI tool (eg due to anatomical variants, artifacts, age-related changes, medical devices, postoperative changes).[56]

System and technical issues

- Lack of transparency and explainability of AI decision-making makes it difficult for reporters to logically understand the basis for the AI recommendation.
- Poor operational integration into existing clinical workflows and infrastructure, such as RIS and PACS.[57]

Professional factors

- Medico-legal concerns, often stemming from the fact that humans remain solely accountable for the final output of the human–AI system.
- Fear of role replacement, with concerns around job security or task displacement within radiology.[58]

Automation complacency is closely related to automation bias but has a slightly different emphasis. Checking becomes less thorough over time because the tool is usually right, so its occasional failures go unnoticed.[32] It becomes more relevant as tools become more capable, making structural safeguards and mandatory human scrutiny critical within safe use principles.

AI factors are conditions in the design, deployment or operational environment of an AI system that make an error more likely, independent of the reporter's skill or judgement. Viewed through a systems framework such as the Swiss Cheese Model, these represent latent conditions – belonging to the system itself rather than the individual clinician.[10] Examples include:

- Operational synchronisation failures: AI outputs not available at the time of reporting, such as in rapid-turnaround emergency workflows.
- Boundary failures: AI is applied to patients and/or images outside of the model's validated intended use case, such as studies with excessive motion artifact.
- Human–AI interaction failures: AI outputs are presented outside the normal workflow, which discourages their use.

Known tool limitations are situations in which the AI tool behaves as its standard operating procedure says it will, such as flagging a normal variant. They are not discrepancies but they are valuable learning cases for REALMs, particularly for reporters who are new to the tool.

Other human factors

It should also be recognised that AI has the potential to influence other human factors and exacerbate some familiar cognitive biases. These include but are not limited to:

- Satisfaction of search – the tendency to curtail the search once an abnormality has been identified so that additional findings are overlooked. This may be enhanced by the presence of an AI output indicating no findings.
- Confirmation bias – the tendency to seek, interpret or favour findings that support an initial impression and discount contradictory evidence. This may be enhanced by the presence of an AI output viewed prior to image review.

REALM AI case review

AI case discussion follows the same learning focus as all REALM cases (see Standard 5). The aim is to understand how the tool and the reporting conditions shaped the case, not to examine the decisions of an individual. Discussion may include:

- **The tool:** Which AI tool and version was used, where known
- **What the tool showed:** A finding, no finding, a probability score
- **How the AI output fitted the reporting process:** Whether it was available at the right time, presented clearly and easy to interpret alongside the images
- **How AI output can shape interpretation:** How an output like this might influence review of the images
- **Which type of learning case it illustrates:** Listed in Standard 7, recognising that more than one may apply
- **What others using the tool should know**
- **Whether the case is suitable for national sharing**

Building the national AI learning resource

- All AI event cases submitted to the RCR learning platform will form a dedicated, searchable AI learning library.
- The RCR REAL Faculty will periodically review AI submissions to identify themes for national awareness, newsletters or educational materials.
- Departments are strongly encouraged to submit all AI learning cases to support this collective resource.
- National sharing is particularly important for AI events because tools are being deployed rapidly and learning from early adopters can protect patients across the whole system.

Key AI definitions

Artificial intelligence (AI)	Software that can perform tasks normally requiring human intelligence, including pattern recognition in medical images.
AI inference	The output generated by an AI tool when applied to a specific imaging study, such as a flagged finding, probability score or region of interest.
Confidence bars/scores	A measure of the AI tool's certainty in its output, often expressed as a probability or percentage. This is quite distinct from the actual probability of disease.
Use case	The specific, approved clinical scenario for which an AI tool has been formally validated, approved and deployed (eg stroke CT triage, chest radiograph lung nodule detection).
Intended use	The purpose, patient group and clinical setting for which an AI tool has been designed and regulatory approved, as stated by the manufacturer. A local use case should fall within the intended use.
Known limitations	Situations in which an AI tool is known to perform less reliably or has not been validated, such as particular patient groups or image types or protocols, as set out in the local standard operating procedure.
Post-market surveillance	The mandatory, ongoing monitoring of an AI tool's performance after deployment, typically led by the vendor with input from clinical users.

Appendix 1: Support and wellbeing resources

Individuals can access rapid, confidential support locally, regionally and nationally through employers, professional bodies and charities. This directory is not exhaustive but includes some of the available resources, starting with urgent crisis intervention.

1. Urgent mental health and crisis support (24/7)

- **NHS mental health services (urgent hub):** Call **111** and select the mental health option to speak directly to a local, trained mental health professional over the phone.
  - Website: www.nhs.uk/nhs-services/mental-health-services/where-to-get-urgent-help-for-mental-health
- **Shout Crisis Text Line:** Free, confidential, 24/7 text support for anyone in crisis.
  - Text: **SHOUT** to **85258**
  - Website: www.giveusashout.org
- **Samaritans:** Immediate, free, confidential listening service.
  - Call: **116 123**

2. Specialised physician and healthcare services

- **NHS Practitioner Health:** A free, completely confidential NHS primary care mental health and addiction service specifically designed for healthcare professionals.
  - Call: **0300 0303 300**
  - Website: www.practitionerhealth.nhs.uk
- **British Medical Association (BMA) counselling and peer support:** Free, confidential, 24/7 counselling line and peer support network open to all UK doctors and medical students, regardless of BMA membership status.
  - Call: **0330 123 1245**
  - Website: www.bma.org.uk/advice-and-support/your-wellbeing
- **BMA doctor support service:** Specifically designed to provide independent, confidential emotional support for doctors undergoing GMC Fitness to Practise investigations or facing a licence withdrawal.
  - Call: **0300 123 1233**
  - Website: www.bma.org.uk/advice-and-support/your-wellbeing/wellbeing-support-services/gmc-investigation-support-doctor-support-service

3. Doctor-specific charities and peer networks

- **Doctors in Distress:** Mental health charity running structured peer support groups, webinars and safe reflective spaces specifically to combat physician burnout and suicide. *Please note: No crisis line.*
  - Email: contact@doctors-in-distress.org.uk
  - Website: www.doctors-in-distress.org.uk
- **Doctors' Support Network (DSN):** Independent, confidential peer support charity specifically for UK doctors and medical students with mental health concerns.
  - Website: www.dsn.org.uk
- **Royal Medical Benevolent Fund (RMBF):** UK charity providing vital financial support, hardship grants and specialised case management for doctors, medical students and their families during illness or crisis.
  - Website: www.rmbf.org
- **You Okay, Doc?:** Mental health charity founded by doctors, supporting physician wellbeing through webinars, a customised support app and peer groups.
  - Website: www.youokaydoc.org

4. Local employer and professional bodies

- **Local NHS trust employee assistance programmes (EAP):** Contact your trust's human resources department or look up the staff intranet wellbeing hub.
- **Workplace wellbeing services:** Local NHS occupational health (OH) departments.
- **The Royal College of Radiologists (the RCR)**
  - Website: www.rcr.ac.uk/career-development/support-wellbeing

5. Digital health, apps and audio resources

- **Unwinding Anxiety app:** An evidence-based, research-backed digital therapy program designed to break the cycles of panic, stress and anxiety.
  - Website: https://unwindinganxiety.com
- **Headspace and Calm apps:** Mindful meditation and sleep hygiene platforms designed to offset systemic occupational stress. (*Note: Check your local NHS trust staff portal, as many regional integrated care boards resource free premium access licences for staff.*)
  - Website: www.calm.com
  - Website: www.headspace.com

Appendix 2: Introductory slide template

REALM

Embracing fallibility – shaping a positive culture for thinking better and learning safely

- We all make mistakes – keep the language constructive and non-judgemental
- Respect and kindness matter – any one of us could be discussing our own case next time
- Anonymity is key – patient details, primary reporters and notifiers remain confidential
- If you recognise a case, please help maintain anonymity
- Share your expertise – collective knowledge benefits us all
- Listen actively and allow colleagues to speak
- There will not always be agreement, but every perspective is valid
- Keep discussions constructive and professional to optimise learning

Appendix 3: Suggested templates

Template 1: Acknowledging receipt of a submission

Subject: REALM case: confirmation required by [date]

Dear [notifier]

Thank you for submitting a case to REALM. Your contribution supports a safe, reflective learning environment focused on shared learning and system improvement.

To optimise communications about this case, please reply to this email by [date] indicating:

1. Primary reporter informed (see Template 2a): Yes / No
2. Escalated via local incident reporting system: Yes / No / Not required
3. Report addended and referring clinician informed: Yes / No / Not required

If you answer 'No' to any item, please add a brief explanation.

Item 1 applies to all cases.

Item 2 applies where the case raises patient safety concerns.

Item 3 applies where the report requires clarification; the referring clinician should be informed if patient care is affected.

Kind regards

[name]

REALM Lead

Template 2a: Notifier to primary reporter (cc REALM lead)

Note: Direct communication from the notifier to the primary reporter is the expected route and is preferred.

Dear [primary reporter]

I have submitted a case to REALM that you have been involved in as I think there is useful learning in it. If you would like to look at this together or to talk it through, please let me know. All cases are anonymised at REALMs. The focus of the discussion is the educational value of the case, not criticism of individual error.

- Examination: [details]
- Date: [date]
- Reason for discussion: [brief detail]

Kind regards

[name]

Template 2b: REALM lead to primary reporter

Note: For use where the notifier has not been able to contact the primary reporter directly, for example where the reporter is off site or has left the department, or where the primary reporter is unknown to them.

Dear [primary reporter]

I am writing to let you know that a case you were involved in has been submitted through the REALM process.

- Examination: [details]
- Date: [date]
- Reason for discussion: [brief detail]

All cases are anonymised at REALMs. The focus of the discussion is the educational value of the case, not criticism of individual error.

Please feel free to get in touch if you would like to discuss this further or contribute learning points.

Kind regards

[name]

REALM Lead

Template 3: Acknowledgement of valuable contributions

Dear [name]

I would like to thank you for your [case contribution / active participation / targeted teaching session] as part of our REALM activity. Your engagement plays an important role in making REALM a positive, supportive and impactful learning space.

Kind regards

[name]

REALM Lead

Template 4: Good spot acknowledgement

Dear [name]

Congratulations on your excellent good spot!

[Brief case reference]

Sharing positive cases like this helps balance learning, boosts team morale and reinforces the value of REALM. Your contribution is very much appreciated.

Kind regards

[name]

REALM Lead

Template 5: REALM case discussion framework

Field	Detail
Case reference	
Modality	CT, MRI, XR, US, NM, IR
AI support tool	☐ Yes ☐ No
Subspecialty	Chest, GI, GU, neuro etc
Anonymised summary	Brief factual summary
Human factors prompt	See Appendix 4
Cognitive bias prompt	See Appendix 4
Learning points	
System concern?	☐ Yes – escalate via agreed pathway ☐ No
Suitable for submission to the RCR learning platform?	☐ Yes ☐ No

Appendix 4: Bias, error awareness and human factors

Cognitive bias involves thinking about our thinking. Human factors can be simplified as 'anything that affects an individual's performance'. In practice the two cannot be separated and REALM considers them both.

Bias and error awareness

Cognitive biases are features of expert thinking and not failings of individuals. The same shortcuts that allow radiologists to report quickly and accurately most of the time will occasionally mislead us.

The table lists some of those biases most often recognised in radiology reporting. For each one, it names the bias, describes what that looks like in practice, outlines the conditions that make it more likely to happen and offers suggestions to help address it. The last two columns are important for REALMs as they ensure constructive discussion.

Bias	What it looks like in radiology – examples	Conditions that make it more likely	What helps
Anchoring	Over-relying on clinical history to interpret findings	Specific diagnosis named on request, a prior report, a phone call or interruption before viewing	Reviewing the images before reading the clinical information; asking 'what else could this be?'
Automation bias	Accepting an AI result without independent review	AI output shown before the reader has looked independently, high AI accuracy building trust, high workload	Workflow that presents AI output after the first read; teaching on AI failure modes (see Standard 7)
Availability bias	Diagnosing a condition seen earlier that day or week	A recent memorable case, a run of similar cases	Awareness that recent cases distort likelihood of another case; think again before proposing a rare diagnosis
Confirmation bias	Early impression of diverticulitis leads the reporter to explain away features of carcinoma	First impression formed on first review, searching to confirm a diagnosis rather than to keep an open mind	Reviewing the images before reading prior reports or the clinical question, describing findings before interpreting them
Framing bias	'?pneumonia' narrows the focus to that diagnosis only	Request wording, referral templates, protocol names	Reporting checklists that prompt a full survey; review before reading clinical information

Inattentional blindness	Overlooking an incidental adrenal mass on trauma CT	Task focus, hanging protocols, high cognitive load	Structured review of areas outside the clinical question; hanging protocol design
Premature closure	Postoperative small bowel obstruction reported as adhesional and internal hernia not considered	Fatigue, backlog, a plausible early explanation	Pausing before sign-off; consider at least one alternative
Satisfaction of search	Missing a lung nodule after identifying an incidental bowel cancer	Time pressure, a striking first finding, interruption after the first finding	A routine checklist to be completed after the main finding; add common blind spots to checklist

This list is not exhaustive. Biases are not mutually exclusive and several may act together in one case. Raising awareness and incorporating these discussions into REALMs enhances our learning.

Awareness of bias by itself has not been shown to reduce error but it still has value.[59] Thinking about how we think gives reporters a way to recognise their own habits of interpretation and to name them without shame. From the literature, the stronger evidence concerns the conditions of our work. Interruption,[60] reporting speed,[61] fatigue[62] and the quality of the clinical request[63] have each been shown to increase error when compared with reporting in their absence.[64] Few studies have tested whether changing these conditions in practice reduces error, but the comparison within each study is the strongest evidence we have currently. Departments and individuals can act on these factors, so the last two columns in the table listing conditions and what might help are the most useful in practice.

Human factors

There are many definitions of human factors but put simply it means *anything that affects an individual's performance*. This is important in the setting of REALMs if we are to make any improvements by better appreciating the systems we work in. The SHEEP model by clinician Debbie Rosenorn-Lanng offers a practical checklist: Systems, Human interaction, Equipment, Environment and Personal factors.[65] It is a way of asking, for any case, which of these five domains was impacting the reporter at the time, corresponding with the conditions column in the table.

To enhance general discussion in the REALM setting about bias, error awareness and human factors, there are a few suggested prompts and questions below with examples.

About the thinking

- With what was known at the time of reporting, what did the images look like?
- Which recognised patterns of thinking or bias might have been influencing here?

Example: CT requested for '?renal stone'. A stone is found and reported but an early appendicitis is not mentioned. This is an example of satisfaction of search and narrowed focus on the clinical question.

About the conditions

- What was likely happening around this report: time of day, workload, interruptions, request quality, equipment, hanging protocol?
- Which of these would have made this event more likely?

Example 1: The reporter was radiologist of the day, fielding frequent interruptions while also responsible for complex trauma CT that needs sustained focus. Both duties are reasonable but simultaneously the reporter is more likely to be impacted by distraction, interruption, fatigue and cognitive overload.

Example 2: CT colonography, prone and supine series often start at slightly different levels. The standard image set, including lung windows for only one series, are made available to the reporter. When the other series starts higher, a lung base lesion appears only on images that are not reviewed on lung windows. The issue is only recognised when several similar cases are discussed at REALM. Reporters assume both series have the same coverage.

About the system

- Is this an isolated event or part of a pattern?
- What could be changed in the process, environment or workflow so that the next reporter is less exposed?
- What is possible within the department and what needs escalating (see Standard 2)?

Example 1: Intermittent overnight decoupling of PACS from the patient record; the reporter has to check manually that the corresponding image and patient information are visible together. If not, it is possible that an examination report could be attributed to the incorrect patient.

Example 2: The PACS proves unreliable in retrieving the most recent study for reporting. A prior examination could be presented in place of the current study and this system failing could affect any reporter. This is a significant risk, particularly while on call and fatigued. Consistent colour coding of current or prior examinations would be a potential system solution, if the failing is escalated appropriately and reporters are alerted to the risk in the interim.

Further learning

The RCR REAL Faculty will provide educational resources on human factors, cognitive bias and safety science.

Appendix 5: Frequently asked questions

1. I am being asked to provide feedback from REALM. What should I do?

Explain what REALM is and point the individual to this RCR REALM guidance. REALM is an educational meeting in which cases are fully anonymised and may be adapted, blended or clustered to optimise the learning. It is not appropriate to share meeting notes, learning points or the identity of those involved in any particular case.

Learning points from REALMs are shared within departments among reporters only and should not be linked to identifiable cases or individual reporters. Only the annual summary, with no case identifiers, may go to a wider distribution including the clinical lead. Where a formal review of a specific case is needed for patient safety incident response or other investigatory purposes, consider redirecting the request to the appropriate route, usually clinical governance.

2. I am being asked to confirm whether a case was discussed at REALM and, if so, when. Can I provide this information?

No. Although cases are anonymised before REALMs, some cases remain recognisable from their nature or detail and confirming a date or that a discussion took place can be enough for individuals to identify a case and, potentially, a reporter. This applies to requests from governance teams and managers, legal teams and coroners. Any such requests should be referred back to governance or medico-legal teams, for individual case scrutiny through non-anonymised specific processes such as candour or review panels. An explanation of what REALM is (see FAQ 1) may be useful to prevent repeated requests for such information.

3. Can the governance lead also be the REALM lead?

No. These roles should be separate and fulfilled by different individuals. This dual role creates a conflict of interest that can undermine trust and psychological safety. Reporters may fear that cases submitted to REALM could be used against them, reducing willingness to speak up. (See Standard 4)

4. Should managers be attending REALMs?

Presence of non-clinical managers can affect the learning and impact open discussion. Inclusion beyond the reporting body should never compromise psychological safety.[20] Broader REALM attendance to include non-clinical managers is therefore not recommended. (See Standard 2)

5. What if a case is also subject to governance or candour?

REALM discussion is educational and does not interact with parallel processes including patient safety incidents. No REALM records, outcomes or learning points should be shared with governance processes. Case scrutiny for investigative purposes should be reviewed without anonymity in an appropriate governance setting with a candour or review panel, according to local trust policy.

6. Should meetings be recorded?

No. REALMs must never be recorded. There would be inevitable impact on open discussion. Meeting set-up should promote trust and psychological safety.

7. What about system-level safety concerns identified through REALM?

Safety or system-level concerns should be escalated through a pre-agreed pathway, without breaching reporter anonymity. The focus should remain on system improvement and not individual accountability. This is not a breach of REALM standards, but it reflects safety-focused learning.[24]

See 'System failings' in Standard 2.

Appendix 6: Key definitions and glossary

REAL	Radiology Events and Learning. An education resource overseen by the REAL Panel on behalf of the RCR.
REALM(s)	Radiology Events and Learning Meeting(s).
Learning event	Any case submitted to REALM because it offers learning. Includes discrepancies, near misses, errors, good spots and AI events.
Discrepancy	A difference between the initial report and a subsequent opinion, whether from another reporter, a retrospective review or later clinical, pathological or imaging findings. A discrepancy is a comparison of outcomes and does not in itself imply error.[1,2]
Acceptable variation	A discrepancy where reasonable practitioners might legitimately differ. Reflects inherent variability in interpretation, not failure.[1,2]
Error	A discrepancy where the finding was present and identifiable on the initial study and a reasonable body of radiologists would be expected to have identified it. May be observational or interpretive.[1]
Near miss	A case where an error or discrepancy was identified and corrected before there is any potential negative impact for the patient. Demonstrates safety systems working as intended.
Good spot	A case demonstrating particularly astute observation or exemplary practice. Celebrates excellence and provides powerful teaching material.
AI event	Any case where AI tools were involved and where the human–AI interaction created a learning opportunity (see Standard 7 and Annex A).
Notifier	The reporter who identifies a learning event in the course of reviewing or reporting a case, in a variety of settings. Also known as the secondary reporter.
Primary reporter	The reporter who originally reported the study.
Peer review	Structured evaluation of work, often using scoring systems.[1]
Peer learning	Educational approach focused on reflection and shared learning. Designed to be non-judgemental, moving away from individual scoring to evaluate broader clinical workflows.[66]

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