The Royal College of Radiologists

Standards for Radiology Events and Learning Meetings (REALMs)

2026 Edition - Working Draft for Consultation

'Embracing Fallibility - Shaping a positive culture for thinking better and learning safely'

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 six per year; protected time; standardized structure; hybrid/virtual options; no recording; separated from governance
3	**Engagement and attendance**	All reporters attend ≥50% of meetings; contribute learning cases and good spots; residents actively involved; subspecialty REALM
4	**Roles and responsibilities**	REALM lead formally appointed with 0.5–1 SPA; notifier role defined; resident involvement; separate from governance lead
5	**Preparing cases for learning**	Fully anonymised; no scoring or grading; standardised review with bias / 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; submitted to RCR platform for national learning
8	**Understanding why errors happen**	Human factors, cognitive bias and safety science; normalises error from complex human–system interaction
9	**Reflective practice and wellbeing**	Connection and peer support to counter professional isolation; group and individual reflection; documentation caution; self-compassion; wellbeing signposting
10	**Building a REAL community through the RCR**	Case submissions to RCR Learning platform; national network of REALM leads identified to RCR REAL faculty; annual review

Executive Summary *(to follow)*

Introduction

Radiology errors are inevitable. 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 interpretive errors throughout their careers (Brady, 2017). This is not a failure of individuals but a fundamental feature of complex work.

These updated standards reaffirm the foundational principle that Radiology Events and Learning Meetings (REALMs) exist as protected, anonymised, educational spaces. They must remain entirely separate from governance, investigation and candour processes and be established as a space where all reporters learn together from error, discrepancy and excellence in a culture of psychological safety and compassionate leadership.

This 2026 edition reflects the evolving landscape of radiology practice: the growth of remote reporting and teleradiology, the expanding multi-professional reporting workforce and the rapid integration of artificial intelligence 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:

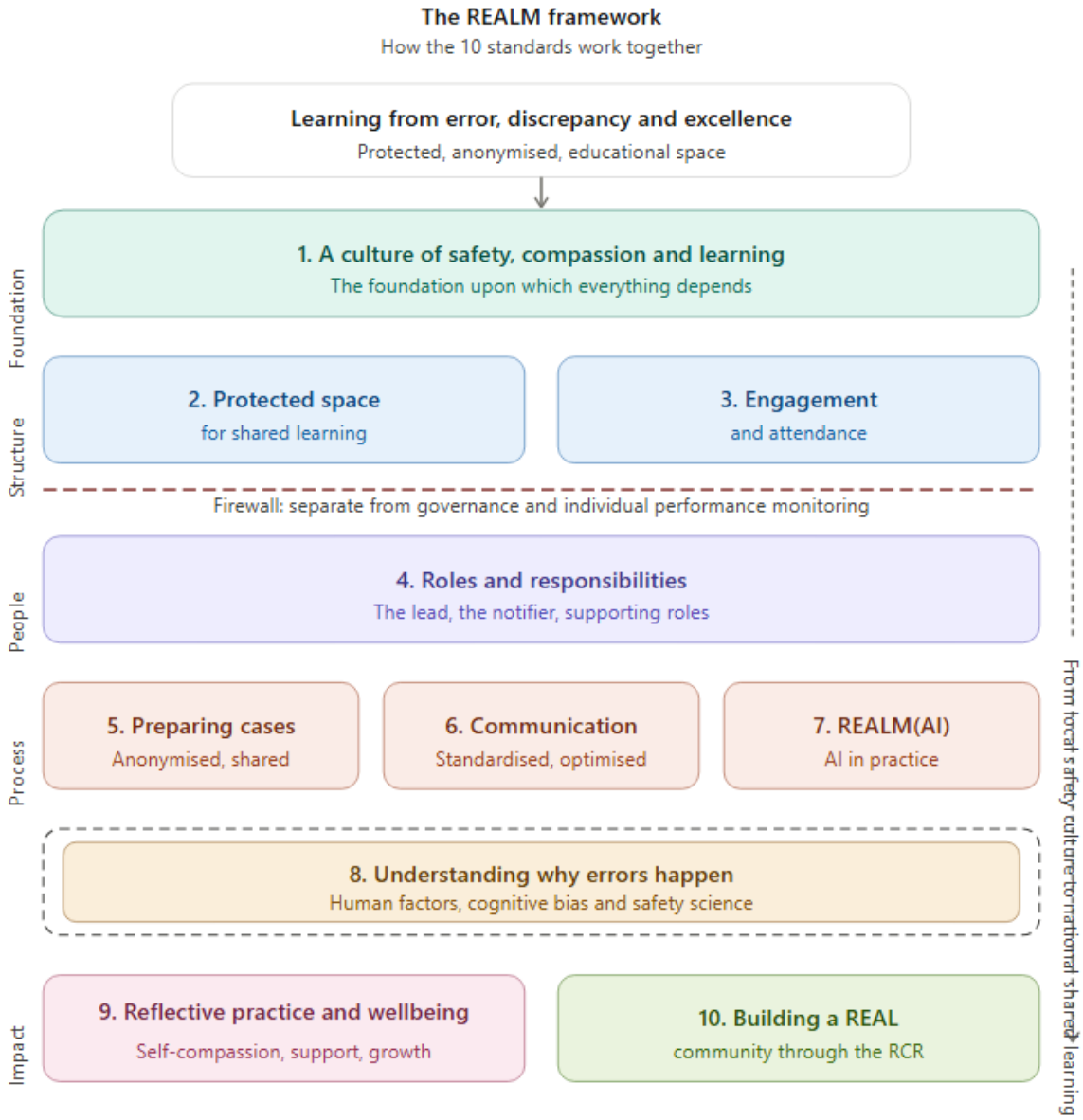
***'Embracing fallibility - shaping a positive culture for thinking better and learning safely**.'*

These standards apply to all individuals engaged in image reporting including consultant radiologists, SAS and trust grade doctors, radiology residents, reporting radiographers and sonographers in all reporting settings.

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 (Zhu et al., 2021; Fong et al., 2020).
- **Workforce expansion:** The number of reporting radiographers has more than doubled between 2020 and 2024 (RCR Census, 2024). All reporters must be included in the REALM process.
- **AI integration:** AI tools are increasingly deployed across stroke imaging, chest radiography and musculoskeletal imaging, introducing new categories of error including automation bias (Kelly et al., 2023).
- **Teleradiology:** Up to 90% of NHS radiology departments now outsource some reporting, creating challenges for consistent learning culture across settings (RCR Workforce Census, 2022).
- **Safety science and human factors:** Growing recognition that diagnostic events arise from complex human–system interactions, not individual carelessness (Reason, 2000; Croskerry, 2009; Kahneman, 2011).

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 without individual consequence
- Improve the quality and safety of radiological practice through collective insights
- Build a national learning community through case contributions and shared resources

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 route for individual scrutiny - there is no attribution, no blame, no consequence
- Not a substitute for candour, serious incident or complaint processes - these are entirely separate
- Not performance management - REALM must never be used to assess individual competence

The Firewall Principle

A clear separation must exist between REALM and all formal governance, investigative and regulatory processes. REALM records must not be used in or made available to any governance, complaint, serious incident, candour or performance management process. Any requests for such information should be declined with a clear explanation. This firewall is the foundation upon which psychological safety depends (Edmondson, 2019; Mann, 2021).

Individual Performance Monitoring Has No Place in REALM

REALM 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.

The 10 Standards

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 (2024)

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:

- The meeting must be conducted in a blame-free, non-judgemental environment where sharing errors and uncertainties 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
    - Recognition that all radiologists make errors, this is inevitable in complex interpretive work
- Compassionate leadership from the REALM lead and senior clinicians who should model vulnerability by sharing learning experiences without declaring specific involvement
- *Organisational culture is shaped by the worst behaviour leadership is willing to tolerate* (Gruenert and Whitaker, 2015)
    - Senior leadership accountability with clinical directors, medical directors and trust leadership actively endorsing REALM and visibly upholding its values.
    - Any behaviour undermining psychological safety (eg. intimidation, public criticism, humiliation) must be addressed promptly and escalated where necessary (Pinto et al., 2018)
- REALM should be embedded with Civility Saves Lives principles and the GMC requirement to treat colleagues with kindness, courtesy and respect (GMC, 2024)
- REALM Leads should seek periodic anonymous feedback on REALM culture and have the leaders and managers support to act on results

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."* – Edmondson, A.C. (1999)

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

Key requirements:

- A minimum of six meetings per year, with local flexibility for more frequent or shorter sessions
- A minimum of 45 minutes of protected discussion time is recommended
- Meetings should be timetabled and protected from service pressures (Baker et al., 2018)
- Hybrid or virtual attendance options should be available. Virtual facilitation requires intentional effort for inclusivity (Wu et al., 2020)
- **REALMs must never be recorded.** There would be inevitable impact on trust and open 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 (Harden, 2022)
- REALMs should involve all reporters - consultant radiologists, SAS/trust grade doctors, residents, reporting radiographers and sonographers
- Broader attendance (managers, non-radiologist clinicians) at the REALM lead's discretion and should never compromise psychological safety (O'Donovan et al., 2021)
- Subspecialty REALMs (paediatric, breast, nuclear medicine, interventional) may run alongside the main REALM
- Dedicated reporting radiographer and resident REALMs may offer additional supportive environments amongst peer groups
- In some subspecialty settings, non-radiologist clinicians report imaging directly. Their inclusion in REALM can greatly strengthen learning by integrating patient-facing insights, broadening understanding of report context and helping radiologists refine reports to better meet clinical needs. When it is appropriate for clinicians to join, they may enhance discussions with their perspectives while maintaining REALM's core principles of anonymity, learning focus and psychological safety
- 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 (bias or human factors related or local SME for targeted teaching or external speaker)
3. Case discussions - learning cases (error, discrepancy, near miss, good spots)
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 investigatory, governance, disciplinary, legal and coronial processes. They are not used to assign blame, scrutinise cases

to determine harm or provide feedback for incident reviews (Harrison et al., 2020). Case reviews for such purposes must be conducted through appropriate non-anonymised mechanisms such as candour or governance-led review panels, depending on organisation policy. (See FAQ, Appendix 5.)

Standard 3: Engagement and Attendance

"You must treat colleagues with kindness, courtesy and respect." – GMC Good Medical Practice, para 48 (2024)

All reporters should attend a minimum of 50% of departmental REALMs, actively contribute cases and participate in meeting discussions.

Key requirements:

- All consultant radiologists, SAS/trust grade doctors, radiology residents, reporting radiographers and sonographers are expected to engage with REALM
- Consultants and SAS doctors should attend at least 50% of the minimum six meetings (at least three annually)
- Every reporter should submit at least one learning case per year with suggested learning points. Submissions with only a patient number and date are unhelpful and should be returned
- Radiology residents should attend general and subspecialty REALMs, documenting attendance for portfolio and ARCP (Morrison et al., 2023)
- Reporting radiographers and sonographers should refer to the Society and College of Radiographers for CPD expectations
- Non-radiologist clinicians who report imaging (eg. cardiologists) should be encouraged to contribute relevant cases and attend REALM, especially in settings where their reporting is integral to the imaging pathway. Their participation enriches learning for both radiology and clinical teams, strengthening interdisciplinary working and diagnostic pathways
- Subspecialty interest groups can be engaged before wider meetings to enhance discussion quality
- In hybrid or remote settings, individuals must take personal responsibility for recording attendance and reflections
- Engagement may be recognised through local acknowledgement schemes (see Appendix 3) or national CPD models through the RCR

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 (2024), for those in leadership roles

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

The REALM Lead

- The REALM lead (or co-leads) should be appointed through a transparent process, accessible to all consultants and SAS doctors
- The role should be recognised in the job plan, with a suggested 0.5 to 1 SPA per week depending on departmental size, meeting frequency and whether a single or dual appointment is made
- The REALM lead should be supported in development of facilitation skills, human factors awareness and psychological safety principles
- Dedicated administrative support is strongly recommended for case submission, meeting coordination, anonymisation, communication and documentation
- The REALM lead must not simultaneously serve as the governance or clinical lead. 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. Separate governance and REALM pathways protect reporters, build confidence and support genuine learning culture (Edmondson, 2019)

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 post meeting
- Escalating system-level concerns to leadership without breaching anonymity (see System Failings section)
- 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, 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 (standardised form, PACS chat, secure 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 are encouraged to provide respectful peer-to-peer feedback directly - by conversation, phone, PACS chat or email
- This communication is not always comfortable. In many cases, notifiers prefer the REALM lead to inform the primary reporter. However, when direct feedback becomes established practice, it normalises the 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
- If the primary reporter has left the trust (locum, 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 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 submission does not exempt notifiers from governance escalation responsibilities, and this responsibility lies outside REALM
- Duty of candour is a statutory obligation. The radiologist must ensure the referring clinician is informed and appropriate governance escalation has occurred
- If in doubt, consult the clinical governance lead. Do not delay escalation

The Role of Radiology Residents

- 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

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 Guide (2009)

Cases must be fully anonymised, discussed in a safe educational environment, classified where appropriate using standard definitions and never scored or graded.

Key requirements:

Anonymisation:

- All patient-identifiable information must be removed before presentation
- Reporter identity must not be disclosed directly or by implication
- PACS anonymisation may be incomplete - embedded reports can reveal details and must be checked!
- Outsourced or externally reported cases may be discussed where anonymity is maintained
- Named recognition for good spots only with explicit consent

Case preparation:

- REALM lead prepares cases using a locally agreed format (PACS, PACSbin, PowerPoint)
- Keep information close to original reporting conditions to provide context, including any typographical errors or abbreviations that can help set the scene
- Learning often comes from communication as well as interpretation

Standardised case review

- Option to classify cases as error, discrepancy, near miss, good spot or AI event
- REALM must never assign error scores, levels of discrepancy or subjective judgements (Gunderman and Donovan, 2020)
- Human factors and cognitive bias prompt (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 subspecialty 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 remains the focus.

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 (2024)

REALM should follow standardised communication processes to ensure consistent, respectful and effective practice across the meeting cycle.

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)
- **Courtesy notification to primary reporter:** A respectful notification should be sent to the primary reporter in advance of the meeting, with local flexibility on timing and approach. Early notification supports openness but may not always be appropriate – local agreement should ensure it supports engagement and maintains psychological safety (see Appendix 3)
- **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**, if available, is invaluable for case management, meeting invitations and circulation of learning outputs
- **Attendance records:** In hybrid or remote settings, individuals must take personal responsibility for recording their own attendance. Face-to-face attendance can be recorded more reliably by the REALM lead. Records should be available for appraisal
- **Annual review:** A periodic review of REALM cases, themes and feedback is encouraged. This helps identify gaps, shapes future teaching and demonstrates the practical impact of REALM. Summarising this review in a short report can feed into departmental educational plans and support quality improvement
- Templates for all key communications are provided in Appendix 3

Standard 7: REALM (AI) – Learning from AI in Practice

"One of the most important potential outgrowths of AI in medicine is the gift of time." - Topol, E.J., Deep Medicine (2019)

REALM should include a dedicated AI learning component to capture and share learning from human-AI interactions. Detailed implementation guidance is provided in Annex A: REALM(AI) Framework

Key requirements:

- Where AI tools are in use, AI-related learning events should be routinely captured and discussed within REALM
- AI cases should use the standard REALM format with additional AI-specific fields (see Annex A)
- A dedicated AI section within REALM or periodic AI-focused meeting should be considered
- Consider a designated REALM(AI) lead for each radiology AI use case - this may be the clinical lead for the AI project or another suitably qualified healthcare professional (see Annex A)
- AI learning cases should routinely be submitted to REAL(AI) resources through the RCR Learning platform for national sharing

AI event type	Description
AI miss	AI failed to detect a finding that was present
AI false positive	AI flagged a finding that was absent or not clinically significant
AI-assisted detection	AI correctly identified a finding the radiologist initially missed
Appropriate AI override	Radiologist correctly overrode an incorrect AI suggestion
Inappropriate AI override	Radiologist overrode an AI suggestion that proved correct
Automation bias event	Radiologist judgement unduly influenced by AI output
Workflow / integration issue	AI tool created a pathway, workflow or presentation problem

- AI serves as a clinical support tool, not a replacement for radiological judgement (Topol, 2019)
- *Ground truth is a key concept that may not be known at the time*
- Radiologists must understand AI limitations; critical results must be scrutinised (Tschandl et al., 2020)
- National sharing is particularly important for AI events to protect patients across the system
- Significant AI errors (misses or misinterpretations) should be reported to the Clinical Safety Officer and AI vendor
- Consider use of the MHRA Yellow Card system (see Annex A)
- Departments not yet using AI should familiarise themselves with the REALM(AI) framework in preparation

Standard 8: Understanding Why Errors Happen - Human Factors, Cognitive Bias and Safety Science

To Err Is Human: Building a Safer Health System – Kohn, Corrigan and Donaldson (2000)

REALM should actively embed human factors thinking, cognitive bias awareness and safety science principles into its learning culture, recognising these as fundamental to understanding radiology events.

Key requirements:

- Radiology events are rarely the result of individual carelessness but they arise from complex human-system interactions (Reason, 2000; Croskerry, 2009)
- Regular educational content on human factors and cognitive bias should be integrated into REALM meetings. Different options include:
    - Short teaching slots on specific cognitive biases relevant to radiology (see Appendix 4)
    - Discussion of system-level factors
    - Case-based illustration of how biases and human factors interact
- The overarching message should be one of normalisation and empowerment: understanding why errors occur helps all reporters develop strategies to mitigate them. This is not about blame, it is about collective improvement
- The REALM lead should develop or access resources to support this teaching. The RCR REAL Faculty and RCR learning platform may provide centrally developed materials
- Departments should consider how human factors principles apply to their own working environment and use REALM as a forum to raise system-level concerns, for which there should be a locally agreed escalation process (see System Failings section)
- Understanding cognitive biases is particularly important as AI tools are integrated into workflows, introducing specific bias types (see Standard 7)

Standard 9: Reflective Practice and Wellbeing

> *Reflecting on experiences, positive or negative, supports professional development, improves care quality and strengthens resilience.* – Adapted from GMC, The Reflective Practitioner (2018)

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

Why This Standard Matters

Radiology is among the specialties most affected by burnout, with prevalence estimates reaching 44–80% (Chetlen et al., 2019). Professional isolation is a significant driver and a risk. It is clear that PACS reduced face-to-face interaction with clinical teams and that remote reporting since the pandemic has compounded this further (Zhu et al., 2021).

The psychological impact of errors can be profound: shame, guilt, anxiety, loss of confidence and a lasting impact on professional identity (Sirriyeh et al., 2010; Waterman et al., 2007). For some, these effects persist indefinitely, leading to withdrawal from practice or leaving clinical work entirely (Scott et al., 2009). The perception that a single error could be career-ending remains a powerful and damaging force (Wu, 2000; Hilfiker, 1984). Burnout and error-related distress directly increase the risk of further diagnostic error, creating a cycle that compromises patient safety (Tawfik et al., 2018).

Connection is protective. Peer support is consistently the most effective mechanism for recovery after adverse events (Pratt and Jachna, 2015; Hu et al., 2012). Research into the emotional needs of healthcare professionals after such events identifies the most important needs as being seen and understood, being met with compassion, being respected, having time to recover and receiving organisational support (Mira et al., 2023). Self-compassion is essential: acknowledging that errors are part of professional growth, not a sign of weakness (Patel et al., 2021).

REALM, built on psychological safety and shared learning, provides a protective counterweight to professional isolation. Supporting reporters is not only a moral imperative but a patient safety intervention. The REALM lead should be able to signpost individuals to available support (see Appendix 1) and support frameworks should be accessible across all reporting settings (Edmondson, 2019; Gunderman and Donovan, 2020; Lee et al., 2013).

REALM as a Forum for Reflective Practice

REALM provides a structured forum for group reflection, drawing on models such as Gibbs' Reflective Cycle (Gibbs, 1988) and Kolb's Experiential Learning Theory (Kolb, 1984). Normalising reflective practice promotes psychological safety, enhances resilience and reduces the risk of burnout by reframing errors as educational opportunities (Arora et al., 2020; Edmondson, 2019).

Departments are encouraged to consider how structured reflective practice settings (whether Schwartz rounds, Balint groups, peer support circles or locally developed models) can sit alongside REALM, creating a broader culture of reflection and mutual support (Moon, 1999).

Documenting Individual Reflection

Participating reporters should be encouraged to record private reflective notes for appraisal and professional development. However, documentation of reflection requires caution:

- The case of Dr Hadiza Bawa-Garba highlighted concerns about the use of reflective documentation in legal proceedings. Although personal reflections were not directly used as evidence, the case underscored the importance of careful documentation (Bourne et al., 2019)
- The GMC has clarified that reflective notes are primarily for personal development and should not include detailed factual accounts not recorded elsewhere. The GMC has advocated for legal protections to ensure reflections cannot be used in court (GMC, 2019)
- The Medical Defence Union advises that reflective notes should be factual, focused on personal learning and avoid speculative or emotive language. Structured frameworks such as “What? So what? Now what?” can guide the process systematically (MDU, 2020)
- 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

Standard 10: Building a REAL Community Through the RCR

"A promise to learn - a commitment to act." Berwick, D.M. (2013)

The REALM lead for each department should be identified to the RCR REAL Panel 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 REAL Faculty for national networking
- Future RCR learning events should include liaison with REALM leads, with the aim of sharing ideas, innovations and fostering excellence
- Each department should submit a minimum of one anonymised learning case and one good spot case per REALM meeting to the RCR learning platform using standardised templates
- AI event cases should also be submitted where applicable
- Resident radiologists 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 build a shared learning resource accessible to all RCR members, enabling the whole community to learn rather than individual departments repeating the same mistakes
- Departments should conduct an annual review of REALM activity against these standards and share a summary (without individually identifiable case information) with departmental and trust leadership to demonstrate value and support resource allocation

Teleradiology and REALM

Teleradiology is now core to UK diagnostic services. The increasing engagement with teleradiology 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 (Patel et al., 2021; Pinto et al., 2018).

- Teleradiology cases should follow the core principles of REALMS standards processes. The same standards of anonymity, culture and governance separation apply regardless of setting
- Cases may be included in the home department’s REALM or / and a provider-level REALM
- There is an increasing expectation on teleradiology providers to present error rate data for individual reporters back to NHS trusts, but REALM should not be used for this purpose. Error rate monitoring is a governance function and must remain separate from the educational REALM process

Learning from System Failings

REALM operates on systems thinking principles as outlined in Standard 8. Most diagnostic events arise from complex interactions between people, processes and environments (Reason, 2000; Croskerry, 2009).

When system-level vulnerabilities are identified (eg. communication failures, IT constraints) these should be escalated to governance teams or departmental leadership. This is not a breach of REALM’s purpose, it reflects safety-focused learning (Berwick, 2013).

This aligns with the aviation “black box” model (Dekker, 2007) and the surgical Operating Room Black Box (Grantcharov et al., 2019). REALM acts as a diagnostic equivalent: a safety net capturing near misses and vulnerabilities for collective learning.

The escalation pathway should:

- Be clearly documented and agreed in advance with departmental leadership
- Focus exclusively on system, process or resource issues - never individual performance
- Be communicated transparently to REALM participants
- Preserve confidentiality and psychological safety at all times

Summary: Escalating system-level concerns enhances, rather than undermines, REALM’s value. It supports a learning culture aligned with these standards. The process must remain focused on improvement, not individual accountability (GMC, 2024; NHS England, 2022).

Annex A: REALM(AI) Framework

Introduction and Scope

This annex supplements the REALM standards to account for the additional possibilities of errors, near misses and learning opportunities arising from the use of AI in radiology. It is considered guidance rather than mandatory.

As the potential uses of AI in healthcare continue to evolve rapidly, this guidance is not exhaustive and will be reviewed and updated when required, and at least annually. It does not yet specifically include guidance on generative AI (e.g. large language models to assist with report creation). It does not address the separate but parallel issues relating to liability – these will be addressed separately by the RCR. (See RCR AI Regulation Position Statement.)

Background: AI as a Medical Device

AI tools used in radiology are classified as software as a medical device and are subject to regulatory oversight. Key considerations include:

- MHRA classification and CE/UKCA marking
- Compliance with DCB0129 (clinical risk management for health IT) and DCB0160 (clinical risk management for deployment)
- Data Protection Impact Assessment (DPIA) and Digital Technology Assessment Criteria (DTAC)
- A documented standard operating procedure for each AI use case, including applications and known limitations
- A change management and education programme ensuring all reporters understand the AI tool before clinical use
- A disclaimer image displayed with the AI inference highlighting the specific uses and limitations of the software
- A system for recording when AI is unavailable at the time of reporting, in case the AI inference is delayed and only returned after the report has been verified

The REALM(AI) Lead

Each radiology AI use case should have a designated REALM(AI) lead. This may be the clinical lead for the AI project or another suitably qualified healthcare professional (radiologist, reporting radiographer or clinician).

The REALM(AI) lead should:

- Review the AI case folder or database at least quarterly
- Report findings to the REALM group or radiology clinical governance group, including a summary with examples and specific learning points
- Share learning, in particular the understanding of bias and factors leading to errors when using AI
- Specifically raise awareness of automation bias
- Report significant AI errors (misses or misinterpretations) to the Clinical Safety Officer and AI vendor. Consider the use of the MHRA Yellow Card system (usually via the Clinical Safety Officer)
- Report significant errors by reporters where the AI inference was overruled

- Report errors due to incorrect use of the AI tool or non-adherence to the SOP (e.g. wrong AI tool used for a stroke pathway; clinician using AI inference alone to guide management rather than the formal radiology report; pathology missed by an AI tool but out of scope of the software)
- Report errors due to process failures (e.g. AI not available or did not process as out of scope, resulting in incorrect triage)
- Report back to radiology and clinical teams if significant changes are made to the AI tool (e.g. change of threshold for a finding)
- Mitigate risk by suggesting improvements to the pathway or SOP, including suspending use of the AI tool (or specific functions) if thought to compromise patient safety in the specific setting
- Lead or guide audits of the AI tool and feed these into the vendor's post-market surveillance system

The Human–AI Disagreement Matrix

When the reporter and AI tool disagree, this creates a learning opportunity. The following matrix provides a framework for classifying these interactions:

	Human correct	**Human incorrect**
AI correct	Learning opportunities – both agree correctly	Potential human bias – human overrides or overcalls correct AI
AI incorrect	Potential AI bias – AI overcall or undercall overridden by human	Potential AI and human bias – both wrongly identify as abnormal, or both fail to detect an abnormality

This matrix is not for scoring or judgement. It is an educational tool to help reporters and departments understand patterns in human–AI interaction and to identify where targeted teaching may be valuable.

Structured Approach to Interpreting Imaging with an AI Inference

When reporting with AI, the following approach is recommended:

1. **Look at the images in the clinical context** - form an initial impression independently
2. **Compare with previous studies** where available
3. **Review the AI inference** - consider the AI output alongside your own assessment
4. **If there is reporter - AI disagreement in a finding, consider:**
    - Is this a known weakness of this AI tool? (eg. CXR AI missing findings behind the heart; CT brain AI missing skull base abnormality; bone radiograph AI overcalling fractures due to skin folds)
    - Does the clinical context make the AI opinion unlikely? (eg. acute chest infection hence consolidation rather than malignancy, but still warranting follow-up)
    - Does previous imaging help make the AI opinion unlikely? (eg. longstanding unchanged lung lesion)
    - If there is more than one AI tool for the modality, is the correct tool being used for the use case?
    - Have a low threshold for seeking a second opinion, especially if less experienced and where it would make a significant difference to the patient. The second opinion should be documented in the report

AI Event Classification

AI events should 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.

Key principles:

- **Transparency:** Radiologists must understand AI's limitations and biases, ensuring critical results are scrutinised (Tschandl et al., 2020)
- **Verification:** Radiologists should verify AI outputs before clinical decisions. AI serves as a clinical support tool, not a replacement (Topol, 2019)
- **Human-AI collaboration:** AI highlights concerns but radiologists remain the final decision-makers (Rajpurkar et al., 2020)

AI Case Review Template – Additional Fields

In addition to the standard case review template (Standard 5), AI cases should include:

- **AI tool name and version** (where known)
- **AI event type** (from Standard 7 classification)
- **What did the AI output?** (e.g. flagged, not flagged, probability score, region of interest)
- **What did the radiologist do?** (eg. agreed, overrode, did not see the AI output)
- **Human-AI interaction analysis:**
    - Did the AI output influence the decision? How?
    - Evidence of automation bias (over-reliance or under-reliance)?
    - Workflow or integration factors?
    - Was the AI output presented clearly and at the right point in the workflow?
- **Learning points specific to AI use**
- **Suitable for national sharing?** (encouraged for all AI cases)

Building the National AI Learning Resource

- All AI event cases submitted to RCR Learning resources 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.

AI vigilance (algorithmovigilance) - The ongoing monitoring of AI tool performance in clinical use, including detection of errors, drift and unexpected behaviour.

Algorithmic shift and drift - Changes in AI tool performance over time, which may occur due to updates to the software, changes in imaging equipment or protocols or changes in the patient population.

Clinical safety officer - A healthcare professional trained as a digital safety practitioner who leads, reviews and maintains the legal documentation required for AI software within the healthcare organisation.

Confidence bars/scores - A measure of the AI tool's certainty in its output, often expressed as a probability or percentage.

Deterministic - Producing the same output for the same input every time. Some AI tools are deterministic; others are probabilistic.

Explainable AI - AI systems designed to provide understandable reasoning for their outputs, enabling clinicians to evaluate the basis for AI-generated findings.

Hazard log - A document required that records identified hazards, their assessed severity and likelihood, and the mitigations in place.

Post-market surveillance - The ongoing monitoring of an AI tool's performance after deployment, typically led by the vendor with input from clinical users.

Secondary capture - The process of saving AI inference results alongside the original imaging study in PACS for review.

Standard operating procedure (SOP) - A documented protocol governing how an AI tool is used within the department, including its intended use case, limitations and escalation pathways.

Use case – The specific clinical scenario for which an AI tool has been validated, approved and deployed (eg. stroke CT triage, chest radiograph lung nodule detection).

Appendix 1: Support and Wellbeing Resources

Individuals can access support through employers, professional bodies and charities:

NHS Trust support: - Employee Assistance Programmes (EAP) – confidential counselling, stress management (usually 24/7) - Workplace wellbeing services – contact your trust's HR department

Royal College of Radiologists: - RCR wellbeing resources: https://www.rcr.ac.uk/education-and-training/trainees/wellbeing - RCR support and wellbeing champions across the UK

British Medical Association: - BMA wellbeing support: 0300 123 1233 | https://www.bma.org.uk/advice-and-support/your-wellbeing - BMA counselling service (24/7): 0330 123 1404

NHS Practitioner Health Programme: - Confidential support for NHS doctors: 0300 0303 300 | https://www.php.nhs.uk/

Charities and external support: - Doctors' Support Network: 020 7383 6258 | https://www.dsn.org.uk/ - Mind: 0300 123 3393 | https://www.mind.org.uk/ - BMA Benevolent Fund: https://www.bma.org.uk/advice-and-support/working-in-medicine/looking-after-you/the-bma-benevolent-fund

General Medical Council: - Support for doctors under investigation: 0161 923 6602 | https://www.gmc-uk.org/

Appendix 2: Introductory Slide Template

REALM – Learning with Kindness and Compassion

Embracing fallibility – building a safer culture to think better and learn 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

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.

This case has been logged as: ☐ Discrepancy ☐ Challenging case ☐ Good spot ☐ System issue ☐ AI event ☐ Other

As the notifier, please ensure you fulfil your professional responsibilities under local policy:

- **Communication with the primary reporter:** where appropriate, please notify the original reporter
- **Escalation:** if the case raises patient safety concerns, please ensure escalation via local incident reporting systems
- **Addendum and clinical communication:** where the report requires clarification, please ensure it is addended and the referring clinician is informed if patient care is affected

Kind regards, REALM Lead, Department / Trust

Template 2: Notification to Primary Reporter

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]

The patient, primary reporter(s) and notifier will not be identified during the meeting. The focus of the discussion is the educational value of the case, not criticism or individual error.

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

Kind regards, REALM Lead, Department / Trust

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, REALM Lead, Department / Trust

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, REALM Lead, Department / Trust

Template 5: Standardised REAL Case Template

Field	Detail
Case reference	
Classification	☐ Error ☐ Discrepancy ☐ Near miss ☐ Good spot ☐ AI event
Modality	CT, MRI, XR, US
Subspeciality	Chest, abdomen, neuro etc
Anonymised summary	Brief factual summary
Human factors prompt	Any system, human interaction, equipment, environmental or personal factors? (see Appendix 4)
Cognitive bias prompt	Any appreciable cognitive bias? (see Appendix 4)
Communication factors	Any handover, communication or workflow issues?
Learning points	Key takeaways
System concern?	☐ Yes - escalate via agreed pathway ☐ No
Suitable for RCR submission?	☐ Yes ☐ No

Appendix 4: Common Causes of Error - Cognitive Biases and Human Factors in Radiology

Bias	Description	Radiology example
Satisfaction of search	Stopping after finding one abnormality	Missing a lung nodule after identifying a rib fracture
Anchoring	Fixating on initial information	Over-relying on clinical history to interpret findings
Availability bias	Overweighting recently seen diagnoses	Diagnosing a condition seen earlier that day
Premature closure	Accepting a diagnosis too early	Attributing symptoms to a known condition without considering alternatives
Confirmation bias	Seeking evidence supporting an existing hypothesis	Focusing on findings confirming the suspected diagnosis
Framing bias	Interpretation shaped by how the question is asked	A request for "? pneumonia" narrowing the search
Inattentional blindness	Missing unexpected findings	Overlooking an incidental adrenal mass on trauma CT
Automation bias	Over-reliance on AI or CAD	Accepting an AI result without independent verification

This is not an exhaustive list but describes those often recognised in radiology.

Human Factors

There are varied and complex definitions of human factors but put simply, human factors is anything that affects an individual's performance. There are multiple models including the 'SHEEP' model outlined by clinician Debbie Rosenorn-Lang. SHEEP refers to Systems, Human interaction, Equipment, Environmental or Personal factors. This framework enables us to think about human factors impacting radiology reporting. These factors are included for educational awareness and not for scrutinising individuals.

Prompts for thinking about human factors in radiology error:

- **What could be changed in the system, process or environment to reduce the likelihood of this happening again?**
- **Is this an isolated event or part of a pattern that suggests a system-level vulnerability?**

Appendix 5: Frequently Asked Questions

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

Decline any requests for REALM information with a clear explanation. REALM is a safe, educational space. Cases are anonymised and may be adapted, blended or clustered as companion cases for learning. REALM is separate from governance, coronial and medicolegal processes. Formal case review should be sought through candour or governance review panels.

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

These roles should be separate and fulfilled by different individuals. Dual roles create conflict of interest and undermine psychological safety.

3. Should managers be attending REALM?

Presence of non-clinical managers can affect the learning and impact open discussion. Broader attendance is at the REALM lead's discretion and must never compromise psychological safety.

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

REALM discussion is purely educational and does not interact with parallel processes. 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/review panel, according to local trust policy.

5. Should meetings be recorded?

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

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

Escalate to governance teams through a pre-agreed pathway, without breaching anonymity. Focus on system improvement and not individual accountability (see System Failings section).

Appendix 6: Key Definitions / Glossary

REAL - Radiology Events and Learning. An education resource overseen by the REAL Panel on behalf of the RCR.

REALM - Radiology Events and Learning Meeting.

Error - A definite mistake in radiological interpretation where the finding was present and identifiable, and where a reasonable body of radiologists would be expected to have identified it. May be observational or interpretive (Brady, 2017).

Discrepancy - A difference in opinion between radiologists where reasonable practitioners might legitimately differ. Reflects inherent variability, not failure (Brady, 2017; Lee et al., 2013).

Near miss - A case where an error or discrepancy was identified and corrected before reaching 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 on review of a previously reported study. 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. Can feel punitive (Brady, 2017).

Peer learning - Educational approach focused on reflection and shared learning. Non-judgemental (Larson et al., 2016).

References

This document was developed by the RCR Radiology Events and Learning (REAL) faculty. It is subject to consultation and review before publication.