Journal Homepage: - www.journalijar.com

INTERNATIONAL JOURNAL OF ADVANCED RESEARCH (IJAR)

Article DOI: 10.21474/IJAR01/21893
DOI URL: http://dx.doi.org/10.21474/IJAR01/21893

RESEARCH ARTICLE

RADIOLOGIST BURNOUT AND ERROR TYPES IN RADIOLOGY: STRATEGIES FOR MITIGATION — A REVIEW

Sisaid.Meliani, K.Meliani, M.Kouadri, O.Ayouche, R.Charif Saibari, N.Bouknani, S.Berrada and A.Rami

1. Department of Radiology, Faculty of Medicine, Mohammed VI University of Sciences and Health – UM6SS, Casablanca, Morocco Cheikh Khalifa International University Hospital, Casablanca, Morocco.

Manuscript Info

Manuscript History
Received: 7 August 2025
Final Accepted: 9 September 2025
Published: October 2025

Key words:-
Radiologist burnout; Diagnostic errors; Perceptual errors; Cognitive errors; Mitigation strategies; Workflow optimization

Abstract

Background: Radiology has become increasingly central to modern medicine, with radiologists facing ever growing workloads, time pressu re, and technological complexity. These factors have contributed to a rising prevalence of professional burnout and diagnostic errors. Burnout not only affects radiologists' well-being but also compromises patient safety.

Objective: To review the main causes and manifestations of burnout among radiologists, describe the major error types encountered in radiological practice, and highlight strategies to mitigate both phenome na.

Conclusion: Burnout and error in radiology are interconnected proble m driven by workload, system inefficiencies, and cognitive limitations. Solutions require a multifaceted approach,including workflow redesign, structured reporting, double-reading, artificial intelligence assistance, and improved workplace well-being initiatives.

Introduction:-

Radiology faces two persistent pressures: high burnout prevalence and a stable background error rate. Recent data place burnout around 40–50%, among the highest across specialties (Parikh 2023; Bailey 2022; Bundy 2024; AMA 2025). Diagnostic inaccuracies remain ~3–5%, largely due to missed visible findings rather than incorrect reasoning (Bruno 2015; Waite 2017; Itri 2024).Burnout compresses the cognitive bandwidth required for sustained search and synthesis (Krupinski 2010). Errors then provoke guilt and defensive over-checking, further taxing cognition (Waite 2017). The cycle is predictable: strain → miss → more strain.Contributing forces include rising case volume, staffing constraints, rapid technology churn, administrative drag, and reading-room isolation (Harolds 2020). This review consolidates evidence and proposes a 12-month, KPI-driven mitigation framework ready for departmental rollout.

Methods:-

Design: Narrative synthesis structured around SANRA domains: justification, literature search, referencing, synthesis, and interpretation.

Corresponding Author:- Sisaid.Meliani
Address:-Department of Radiology, Faculty of Medicine, Mohammed VI University of Sciences and Health – UM6SS, Casablanca, Morocco Cheikh Khalifa International University Hospital,Casablanca, Morocco.

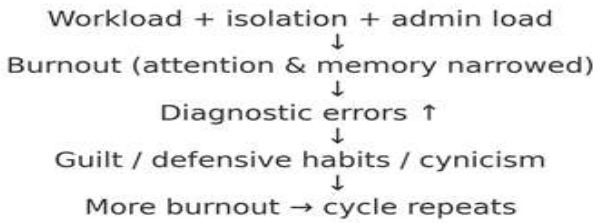
Search strategy: PubMed, MEDLINE, Embase, and Google Scholar were searched for January 2010–October 2025 using combinations of: radiologist/radiology burnout, diagnostic/perceptual error, cognitive bias, mitigation, workflow, artificial intelligence. Full strings appear in the Supplement.Screening and eligibility: Two authors independently screened titles/abstracts and reviewed full texts as needed; disagreements were resolved by discussion. Inclusion: peer-reviewed work on radiologist burnout (prevalence, drivers, mitigation), error mechanisms/rates/types, or tested interventions. Exclusion: non-English, opinion without data, case reports, non-radiology populations.

Study selection summary:
Records identified: 1,847 → Excluded at screening: 1,535 → Full texts assessed: 312 → Excluded after full text: 156 (non-radiology/no outcomes/duplicate/low quality) → Included: 156 (89 observational, 34 trials, 33 reviews) +12 via citation tracking.Evidence grading: Modified GRADE: A (multiple RCTs/strong observational consistency), B (limited trials or consistent moderate evidence), C (expert opinion/conflicting).Synthesis and limitations: Themes included burnout epidemiology, error taxonomy, causal mechanisms, and mitigation. No meta-analysis due to heterogeneity. Limitations: publication bias, English-only restriction, self-reporting for burnout measures.

Discussion:-

Burnout: Scope and Drivers :
Across studies, 39–54% meet burnout thresholds; some cohorts report >60% (Alhasan 2023). Post-pandemic U.S. surveys show modest improvement from 2021 peaks yet remain above pre-2015 levels (AMA 2025). The key contributors are workload pressure with utilisation outpacing staffing (Bhargavan 2005); isolation in reading rooms; technology churn; administrative burden (Erickson 2017); and autonomy loss via throughput-centric incentives. The Manifestations and impact are a triad of energy depletion, detachment, and diminished sense of efficacy. Fatiaue studies show progressive detection decline during long or consecutive overnight sessions (Krupinski 2010; Ruutiainen 2013).

Where and Why Errors Happen:-
Perceptual misses (≈60–80%): Findings present on images but not captured by gaze or working memory. Eye-tracking reveals narrow early sweeps; discovering one finding truncates subsequent search (satisfaction of search). Fatigue further lowers sensitivity (Krupinski 2010; Waite 2017).Cognitive mistakes (≈20–30%): Lesions seen but misinterpreted due to reasoning traps, chiefly anchoring, premature closure, availability, and confirmation biases (Waite 2017). Technical, communication, and system faults: Technical 5–10% (artifacts, protocol, timing); communication 3–8% (ambiguity, delay); system 5–15% (missing priors, IT failures, follow-up tracking gaps) (Lee 2013).



The Burnout–Error Feedback Loop :
Figure 1. Conceptual loop illustrating the reciprocal relationship between workload, burnout, diagnostic errors, and subsequent strain.

Evidence-Based Mitigation Framework

Category	Core action	Evidence	3-month checkpoint	12-month goal	Lead	Timeline
Workflow	Structured reporting templates	A	Clarity +15%	+30%; variance −40%	IT + Leadership	3–6 mo
Workflow	Intelligent case	B	Balanced load	Discrepancies −20%	Ops + IT	6–9 mo

	allocation					
Workflow	Protected micro-breaks	A	Fatigue metrics stable	Miss rate −15%	Management	1 mo
Double reading	Mammography double-read	A	Detection +10%	Recall rise <5%	QA	3 mo
Double reading	AI-triggered selective second read	B	High-risk discrepancies −20%	Overall −25%	QA + IT	6 mo
AI	Triage/alert models	B	TAT −15%	Alert balance maintained	IT	6–12 mo
AI	Monitor alert fatigue & acceptance	B	Dismissal rate tracked	>70% positive user rating	IT + Rads	Ongoing
Education	Bias-awareness sessions	B	Knowledge ↑	Bias-linked errors −25%	Training	Quarterly
Wellness	Flexible scheduling/remote	B	Work–life conflict −20%	Burnout −15%	HR	6 mo
Systems	Auto-retrieve priors	B	Missing comparisons −80%	<5% without priors	IT	6 mo
Systems	Follow-up tracker	B	Overdues −30%	Close-loop >90%	QI	9 mo
Systems	Anonymous learning-focused error log	B	Reports ×2	Safety score +25%	QI	3 mo

Table 1 summarises the intervention matrix with ownership and targets.

Workflow redesign:-
Templates improve completeness and clarity (Grade A). Intelligent routing aligns case complexity with expertise (Grade B). Enforced short breaks preserve vigilance. Monitor clarity and discrepancy metrics monthly.

Selective second reading:-
Independent double reading in screening mammography improves detection by 8–15% (Gilbert 2008; Taylor-Phillips 2018). Elsewhere, target second reads to AI-flagged low-confidence or high-risk cases to optimise resources (Grade B).

AI as calibrated augmentation:
AI can surface critical findings and subtle lesions, but impact depends on false-positive control, transparency, and trust (Liu 2024; Hosny 2018). Where acceptance is low, higher AI exposure correlates with higher burnout (Bundy 2024; Alexander 2025). Safeguards: false alerts <15/100 studies; manual override; confidence displays; quarterly acceptance audits. Pilot one algorithm (e.g., ICH triage) before scale-up.

Cognitive-bias education:
Quarterly 90-minute sessions with didactics, anonymised cases, and simulation. Add forcing functions to reports: require a differential, contradiction check, and documented critical-result communication before sign-off. Early programs report 20–30% reduction in bias-linked discrepancies.

Wellness with measurable KPIs:
Implement flexible scheduling, remote reading, quarterly Mini-Z or MBI-short surveys, adequate staffing, confidential counselling, and protected-time resilience training (West 2016). Target counselling utilisation 10–15% and 15% reduction in high-burnout prevalence within a year.

System and environment upgrades:
Integrate PACS–RIS–EMR; accurate voice recognition; ergonomic, low-glare, acoustically treated rooms (Krupinski 2012). Use an anonymous, learning-focused error pathway (Reason 2000). Close the loop on recommendations with automated reminders; aim for <10% overdue follow-ups.

Trainees:
Resident burnout often exceeds 55%; >10 consecutive overnight hours doubles preliminary error rates (Ruutiainen 2013). Actions: graded autonomy, mandatory post-call recovery, preserved teaching time (~20%), structured mentorship.

Teleradiology and night work:-
Circadian misalignment reduces vigilance. Limit consecutive nights, ensure 48 h recovery before day shifts, verify home-station ergonomics, schedule peer contact. Overnight, favour high-specificity AI to minimise false alerts (Alexander 2025).

Moral injury:-
When workload and constraints force practice below professional standards, moral injury drives attrition. Responses: transparent leadership, shared governance, incentives that reward quality, and external advocacy for sustainable practice.

Economic rationale:-
Replacing a radiologist costs $250–500k plus 12–18 months to full productivity (Johnson 1992). Comprehensive mitigation frequently returns 2.5–4× via retention and fewer error-related costs. Track quarterly: turnover × replacement cost + malpractice offsets vs programme spend.

Implementation Roadmap:

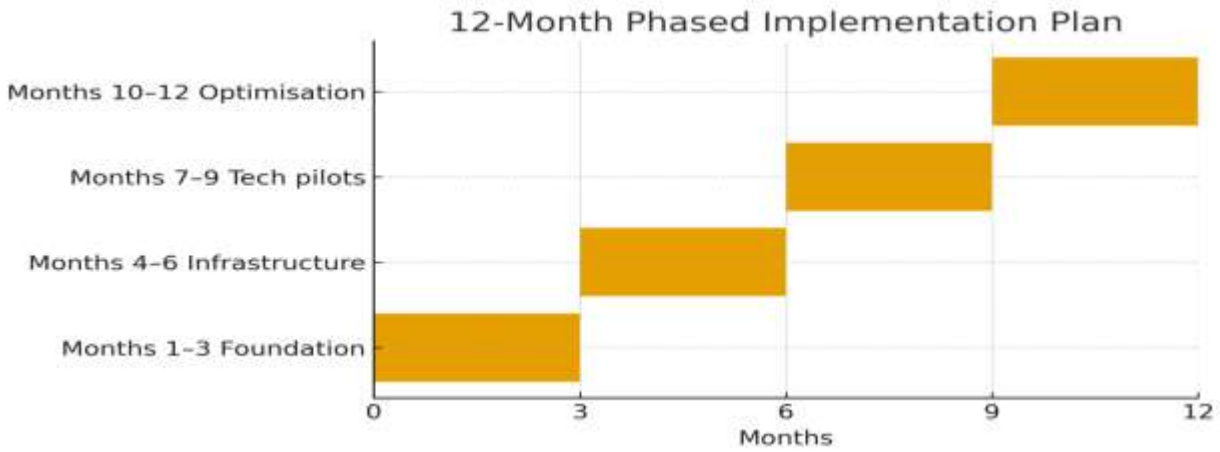


Figure 2. Phased 12-month plan:

Monitoring and Continuous Improvement:-

Monthly dashboard (Table 2) and quarterly/annual review cadence as described.

Metric	Baseline	3 mo	12 mo
High-burnout prevalence (%)	45	40	≤33
Miss/addendum rate (%)	4.2	3.7	3.0
Critical-finding TAT (min)	73	65	55
AI false positives per 100	18	12	<10
AI satisfaction (% positive)	–	>60	>70

Error reports per month	12	20	35
Annual turnover (%)	14	12	<10
Work–life score (1–10)	4.8	5.3	6.3

Table 2. Dashboard metrics (monthly review).

Conclusion:-

Radiologist burnout and diagnostic errors are intertwined challenges in contemporary practice. Burnout erodes concentration and resilience, thereby increasing the likelihood of error; in turn, diagnostic mistakes can intensify stress and professional dissatisfaction. Burnout and diagnostic error are entrenched and mutually reinforcing. Durable improvement requires department-wide execution: streamlined workflows, selective second reads, carefully integrated AI with attention to alert burden and trust, bias-aware reporting, true psychological safety, and an environment designed for human performance. Protecting the reader protects the patient. With explicit ownership and quantitative targets, radiology services can achieve clinically meaningful gains within one year. Tackling burnout and errors protects radiologists and ensures patient safety while sustaining the integrity of diagnostic imaging.

References:-

1. Alexander R, Waite S. The role of AI in mitigating radiologist shortages and burnout. npj Digital Medicine. 2025;8:23. doi:10.1038/s41746-025-00023-6.
2. Alhasan M, Hasaneen M. Incidence and factors associated with burnout in radiologists: a systematic review. Eur Radiol Exp. 2023;7(1):66. doi:10.1186/s41747-023-00381-2.
3. American Medical Association. Physician burnout and depression report 2025. 2025. Accessed 10 Oct 2025.
4. Bailey JE, Sanger PC, Gould J, et al. Addressing radiologist burnout: current strategies and future directions. Radiographics. 2022;42(5):1280-1295. doi:10.1148/rg.220045.
5. Berlin L. Radiologic errors and malpractice: a blurry distinction. AJR Am J Roentgenol. 2007;189(3):517-522. doi:10.2214/AJR.07.2209.
6. Bhargavan M, Sunshine JH. Utilization of radiology services in the United States: levels and trends in modalities, regions, and populations. Radiology. 2005;234(3):824-832. doi:10.1148/radiol.2343031536.
7. Bruno MA, Walker EA, Abujudeh HH. Understanding and confronting our mistakes: the epidemiology of error in radiology and strategies for error reduction. Radiographics. 2015;35(6):1668-1676. doi:10.1148/rg.2015150023.
8. Bundy JJ, Hage AN, Srinivasa RN, et al. Artificial intelligence and radiologist burnout. JAMA Netw Open. 2024;7(11):e2442795. doi:10.1001/jamanetworkopen.2024.42795.
9. Erickson SM, Rockwern B, Koltov M, McLean RM. Putting patients first by reducing administrative tasks in health care. Ann Intern Med. 2017;166(9):659-661. doi:10.7326/M16-2697.
10. Gilbert FJ, Astley SM, Gillan MG, et al. Single reading with computer-aided detection for screening mammography. N Engl J Med. 2008;359(16):1675-1684. doi:10.1056/NEJMoa0803545.
11. Harolds JA. Physician burnout. Clin Nucl Med. 2020;45(3):e154-e155. doi:10.1097/RLU.0000000000002915.
12. Hosny A, Parmar C, Quackenbush J, Schwartz LH, Aerts HJWL. Artificial intelligence in radiology. Nat Rev Cancer. 2018;18(8):500-510. doi:10.1038/s41568-018-0016-5.
13. Itri JN, Modarresi TS. Shift volume directly impacts neuroradiology error rate. AJNR Am J Neuroradiol. 2024;45(7):907-911. doi:10.3174/ajnr.A8223.
14. Johnson WG, Brennan TA, Newhouse JP, et al. The economic consequences of medical injuries: implications for a no-fault insurance plan. JAMA. 1992;267(18):2487-2492. doi:10.1001/jama.1992.03480180085037.
15. Krupinski EA, Berbaum KS, Caldwell RT, et al. Long radiology workdays reduce detection and accommodation accuracy. J Am Coll Radiol. 2010;7(9):698-704. doi:10.1016/j.jacr.2010.03.004.
16. Krupinski EA, Kallergi M. Choosing a radiology workstation: technical and clinical considerations. Radiology. 2012;242(3):671-682. doi:10.1148/radiol.2423051403.
17. Lee CS, Nagy PG, Weaver SJ, Newman-Toker DE. Cognitive and system factors contributing to diagnostic errors in radiology. AJR Am J Roentgenol. 2013;201(3):611-617. doi:10.2214/AJR.12.10375.
18. Lehman CD, Wellman RD, Buist DSM, et al. Diagnostic accuracy of digital screening mammography with and without computer-aided detection. JAMA Intern Med. 2015;175(11):1828-1837. doi:10.1001/jamainternmed.2015.5231.

19. Liu Y, Chen PHC, Krause J, Peng L. Artificial intelligence in radiology: impact on workflow, performance, and burnout. Radiol Artif Intell. 2024;6(2):e230145. doi:10.1148/ryai.230145.
20. Parikh JR, Katabathina VS, Smith EA, et al. Prevalence and drivers of burnout in private practice radiologists. Acad Radiol. 2023;30(8):1622-1630. doi:10.1016/j.acra.2022.11.015.
21. Pinto A, Brunese L, Pinto F, Acampora C, Romano L. E-learning and education in radiology. Eur J Radiol. 2011;78(3):368-371. doi:10.1016/j.ejrad.2010.12.029.
22. Reason J. Human error: models and management. BMJ. 2000;320(7237):768-770. doi:10.1136/bmj.320.7237.768.
23. Ruutiainen AT, Durand DJ, Scanlon MH, Itri JN. Increased error rates in preliminary reports issued by radiology residents working more than 10 consecutive hours overnight. Acad Radiol. 2013;20(3):305-311. doi:10.1016/j.acra.2012.09.028.
24. Shanafelt TD, Boone S, Tan L, et al. Burnout and satisfaction with work-life balance among US physicians. Arch Intern Med. 2012;172(18):1377-1385. doi:10.1001/archinternmed.2012.3199.
25. Taylor-Phillips S, Jenkinson D, Stinton C, et al. Double reading in breast cancer screening: cohort evaluation in the CO-OPS trial. Radiology. 2018;287(3):749-757. doi:10.1148/radiol.2018171137.
26. Thrall JH. Prevalence and costs of chronic disease in a health care system structured for treatment of acute illness. Radiology. 2005;235(1):9-12. doi:10.1148/radiol.2351041768.
27. Waite S, Kolla S, Jeudy J, et al. Tired in the reading room: influence of fatigue in radiology. J Am Coll Radiol. 2017;14(2):191-197. doi:10.1016/j.jacr.2016.10.009.
28. Waite S, Scott J, Gale B, et al. Interpretive error in radiology. AJR Am J Roentgenol. 2017;208(4):739-749. doi:10.2214/AJR.16.16963.
29. West CP, Dyrbye LN, Erwin PJ, Shanafelt TD. Interventions to prevent and reduce physician burnout: a systematic review and meta-analysis. Lancet. 2016;388(10057):2272-2281. doi:10.1016/S0140-6736(16)31279-X.