

# MANAGING CLAUSTROPHOBIA IN MRI EXAMINATION: A MINI REVIEW

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## ABSTRACT

Magnetic resonance imaging (MRI) is a cornerstone of modern diagnostic practice. However, anxiety and claustrophobia related to confined spaces, acoustic noise, and enforced immobility remain important barriers to successful image acquisition. These responses may lead to premature scan termination, motion artefacts, and compromised diagnostic quality. Although overall MRI failure rates are relatively low, recent evidence indicates that incomplete examinations are disproportionately concentrated among specific high-risk subpopulations. Patient tolerance is influenced by an interplay of human, environmental, and technology-related factors. This mini-review synthesises current evidence on interventions to reduce claustrophobia during MRI examinations, drawing on literature published between 2020 and 2025 and prioritising systematic, comparative, and practice-oriented studies. Psychological and experiential strategies, hardware and environmental modifications, and pharmacological approaches are reviewed. Psychological interventions, including structured pre-scan communication, music or audiovisual distraction, and mirror- or prism-based visual reorientation, consistently improve patient comfort and examination compliance. Technological solutions, such as open or upright MRI systems, offer benefits for selected patients; but bore diameter alone does not appear to be a decisive determinant of claustrophobia reduction. Pharmacological sedation, when delivered within established safety frameworks, is associated with very high scan completion rates in patients who are unable to tolerate MRI using non-pharmacological measures alone. Collectively, the evidence supports a pragmatic, stepwise approach to managing MRI-related claustrophobia: early risk identification at booking, universal application of communication and distraction strategies, selective matching of scanner hardware for high-need patients, and the judicious use of protocol-guided sedation when necessary. Adopting this structured strategy can enhance the patient experience, maintain procedural safety, and optimise diagnostic yield in contemporary MRI practice.

### Keywords:

Magnetic resonance imaging, claustrophobia, patient tolerance, non-pharmacological intervention

## INTRODUCTION

Magnetic resonance imaging (MRI) places patients in an environment characterised by prolonged immobility, spatial confinement, and high acoustic noise. For some individuals, this combination triggers anxiety, panic, or claustrophobic reactions that interfere with cooperation during the examination. Anxiety typically refers to anticipatory unease or heightened worry related to the procedure itself, including concerns about confinement, noise, immobility, or scan outcomes (American Psychiatric Association [APA], 2022). Panic represents an acute, episodic escalation of fear that may occur during scanning and is commonly accompanied by autonomic and physiological symptoms such as palpitations, dyspnoea, or dizziness; panic attacks may be situationally triggered and can occur within other anxiety disorders. Claustrophobia, by contrast, is classified as a specific situational phobia and is characterised by a marked and persistent fear of enclosed or confined spaces, with MRI scanners representing a common provoking stimulus (APA, 2022).

These responses commonly manifest as involuntary movement, resulting in motion artefacts, and may escalate to early discontinuation of the scan. Recent service-level data indicate that the incidence of incomplete MRI examinations due to claustrophobia is typically below 1%, with meta-analyses reporting premature termination rates of approximately 0.5–5% and pooled estimates around 1.8% across diverse clinical settings (Hudson et al., 2022). Evidence from service-level evaluations over the past five years indicates that, although the overall proportion of MRI examinations abandoned due to claustrophobia is relatively small, the operational consequences are non-trivial. The impact is particularly pronounced in head-first acquisitions and head-and-neck protocols, with higher failure rates observed among clearly defined high-risk patient groups. Such disruptions contribute not only to immediate inefficiencies, including repeated sequences, reappointments, and prolonged booking slots, but also to cumulative strain on patient satisfaction and imaging workflow efficiency (Hudson et al., 2022).

Current literature increasingly recognises MRI-related claustrophobia as the result of interacting determinants rather than a single causative factor. Physical aspects of the scanner environment, such as bore geometry, lighting conditions, and airflow, intersect with human factors, including the adequacy of pre-examination explanations and the nature of communication during image acquisition. These elements further interact with individual patient characteristics, notably baseline anxiety levels and prior adverse imaging experiences. Recent qualitative and mixed-methods reviews highlight that standardised, patient-centred communication strategies, encompassing clear preparatory information, agreed termination

signals, and continuous verbal reassurance, can significantly improve perceived control and tolerance even without additional technological modifications (Lawal et al., 2024).

In parallel, advancements in MRI system design and sedation practices have expanded the range of available mitigation strategies. Studies focusing on open and upright MRI configurations suggest meaningful reductions in claustrophobic responses and reliance on sedative agents within selected patient subgroups. Nevertheless, findings remain inconsistent when bore diameter is considered in isolation, indicating that broader design features and patient–technology interactions are likely more influential than size alone (Behluli et al., 2024). Pharmacological interventions, including oral anxiolytics and monitored sedation, continue to play a critical role for patients who do not respond adequately to behavioural or environmental measures.

This mini-review integrates evidence published between 2020 and 2025 across three interrelated domains: psychological and experiential interventions, scanner technology and environmental design, and pharmacological management. The objective is to identify pragmatic, evidence-based approaches that enhance examination completion and patient experience while maintaining diagnostic integrity and safety in modern MRI practice. Preference is given to systematic and comparative studies, and pharmacologic recommendations are aligned with contemporary specialty guidelines.

### METHODS

This mini-review adopted a narrative synthesis approach informed by a structured literature search. Relevant studies were identified through searches of PubMed, Scopus, and Web of Science, covering literature published between 2020 and 2025. Search terms included combinations of “MRI,” “claustrophobia,” “anxiety,” “panic,” “scan intolerance,” “sedation,” and “patient experience.” Eligible publications included systematic reviews, comparative and observational studies, qualitative syntheses, and service-level evaluations focusing on adult MRI practice. Studies were excluded if they were limited exclusively to paediatric populations, non-MRI imaging modalities, or non-clinical experimental settings. Greater emphasis was placed on systematic reviews, comparative studies, and practice-oriented service evaluations, as these designs offer higher relevance for informing pragmatic clinical strategies and operational decision-making in contemporary MRI services.

## RESULTS

### **Patient-Centred Non-Pharmacological Strategies**

#### *Structured briefing and communication*

Recent evidence consistently demonstrates that human interaction plays a central role in reducing MRI-related anxiety. Practice-oriented studies involving both radiographers and patients show that a concise yet structured pre-scan explanation that covers expected sensations, scan duration, and clear instructions on how to pause or stop the examination can substantially reduce anticipatory stress. Ongoing verbal reassurance during image acquisition further supports emotional regulation and patient cooperation. Additionally, as social media platforms have emerged as important health communication tools influencing health behaviours and quality of life, brief educational content delivered via social media or online platforms can supplement in-person briefings, providing patients with visual and auditory exposure to the MRI environment and procedural expectations (Paul et al., 2025; Chen et al., 2023). These measures are low cost, easily scalable, and applicable across different scanner designs and clinical settings, making them highly practical for routine implementation (Lawal et al., 2024).

#### *Music and audiovisual distraction*

A 2024 systematic review and meta-analysis examining imaging environments found that music-based interventions are associated with meaningful reductions in procedural anxiety and improvements in perceived comfort. Delivery methods such as headphones or in-bore speakers are simple to implement and can be readily combined with other coping strategies. Although effect sizes vary across patient populations and scan protocols, the overall direction of benefit is consistent, supporting the use of music or audiovisual content as a first-line supportive measure (Vieira et al., 2024). However, these interventions may be constrained by individual patient preferences and compatibility with required hearing protection, which could affect the approach's feasibility and effectiveness in certain clinical settings (Vieira et al., 2024).

#### *Visual orientation and perception of space*

Devices that allow patients to visually orient themselves outside the bore, including mirrors and prism glasses, alongside enhanced lighting and gentle airflow, have been reported to alleviate feelings of confinement. Qualitative syntheses and service-level guidance frequently recommend these environmental adaptations as part of a baseline comfort package, particularly for patients with known anxiety or previous intolerance to MRI (Lawal et al., 2024).

*Immersive pre-examination preparation*

Emerging preparatory approaches, initially developed in paediatric settings and increasingly adapted for adults, include smartphone-based virtual reality and room-based audiovisual simulations. These tools familiarise patients with scanner sounds, positioning, and procedural flow prior to the examination. A previous study found that familiarisation with scanner sounds, positioning, and procedural flow has consistently reduced anxiety scores and workflow interruptions especially among paediatric populations (Nieto Alvarez et al., 2024). Evidence in adult MRI services remains limited, with only preliminary studies suggesting similar reductions in anxiety and scan disruption; therefore, these interventions are currently best reserved for adults identified as high risk or those with prior failed scans.

Early studies suggest reductions in anxiety scores and fewer workflow interruptions, although robust randomised evidence in adult populations remains limited. At present, immersive preparation may be best reserved as an adjunct for patients identified as high risk or those with prior failed scans (Lawal et al., 2024). Additionally, there is currently no validated, widely adopted screening tool for assessing claustrophobia in adult MRI patients, representing an important research gap that future studies should address to improve patient triage and targeted intervention.

*Screening and triage at booking*

Although no standardised screening tool is mandated within radiology pathways, service-level evaluations suggest that brief screening questions at booking or check-in can be effective. Examples of such screening include asking patients about prior MRI intolerance or self-reported claustrophobia, and using brief validated measures such as the Claustrophobia Questionnaire (CLQ), which has demonstrated reliability and validity for assessing claustrophobic fear and predicting claustrophobia-related distress, including in MRI settings (Radomsky et al., 2001), or general anxiety screening tools like the Generalized Anxiety Disorder 7-item scale (GAD-7), a widely validated brief self-report measure for anxiety severity and screening in clinical and research contexts (Spitzer et al., 2006).

Enquiring about previous MRI intolerance or current scan-related anxiety helps identify patients who may benefit from additional preparation, alternative scanner allocation, or early consideration of pharmacologic support. This pragmatic approach can be integrated into routine administrative workflows and supports more efficient use of departmental resources (Hudson et al., 2022).

Overall, the literature indicates that human-centred interventions represent the most accessible and impactful first-line strategies. Clear explanations, structured communication, and simple sensory distractions are inexpensive, easy to deploy, and consistently associated with improved patient experience and reduced scan disruption. Where available, immersive preparation may offer an added benefit for patients with pronounced anxiety.

### **Scanner Design and Environmental Adaptation**

It is important to distinguish between patient-reported outcomes and objective outcomes. Both types of outcomes provide complementary insights into the effectiveness of scanner design interventions. Patient-reported comfort refers to subjective measures such as perceived anxiety, ease of breathing, and overall comfort during the scan, whereas objective outcomes include measurable endpoints such as scan completion rates and the occurrence of motion artifacts. The following sections discuss interventions to improve patient-reported comfort measures and objective outcomes, and their impact on MRI quality and workflow.

#### *Open and upright systems versus conventional scanners*

A patient-focused comparison conducted in 2024 reported substantially lower rates of claustrophobia, fewer prematurely terminated examinations, and reduced reliance on sedatives among patients scanned using open or upright MRI systems. Despite these advantages, the study also highlighted that effective technologist-patient communication remained essential, even when more patient-friendly hardware was used. These findings support preferential scheduling of screen-positive patients to open or upright scanners when diagnostic requirements permit (Behluli et al., 2024).

#### *Bore size and structural characteristics*

In contrast, a 2024 study published in Scientific Reports found no significant differences in perceived claustrophobia between scanners with 60 cm and 70 cm bores, across multiple manufacturers, and even between open and closed systems within the sampled population. This suggests that while wider or shorter bores are often perceived as beneficial, bore diameter alone does not determine patient tolerance. Hardware considerations should therefore be integrated with communication strategies and coping interventions rather than relied upon in isolation (Dostál et al., 2024).

*Environmental optimisation within closed systems*

Even when conventional closed-bore scanners are used, targeted environmental adjustments can improve patient comfort. Improvements in ventilation, lighting, table cushioning, intercom clarity, and real-time feedback mechanisms have been associated with reduced perceptions of confinement and enhanced cooperation. These elements are frequently cited in qualitative studies and service recommendations as components of a comprehensive comfort bundle (Lawal et al., 2024).

*Operational and scheduling implications*

From a service-delivery perspective, allocating open- or short-bore scanner slots to patients identified as high risk may be more cost-effective than upgrading scanner infrastructure for all patients. However, formal economic evaluations remain limited, and the impact on workflow throughput, scanner utilisation, and appointment scheduling has not been systematically quantified. Future studies employing operational modelling or cost-effectiveness analyses are needed to elucidate potential trade-offs and optimise resource allocation. Given mixed evidence on the population-level benefits of larger bores, selective patient-to-scanner matching appears to preserve workflow efficiency while improving tolerance among vulnerable groups. Although questions remain regarding optimal screening thresholds and scheduling algorithms, available evidence supports targeted deployment of alternative hardware (Behluli et al., 2024).

Taken together, scanner design and environmental factors play an important but variable role in patient tolerance. The greatest benefit appears when technological adaptations are combined with strong human-factors approaches rather than implemented as standalone solutions.

**Pharmacological Management and Governance***Indications for escalation*

For patients who remain highly anxious despite adequate preparation, or who have previously failed an MRI examination, protocol-based anxiolysis or monitored sedation can reliably facilitate scan completion. Contemporary reviews of adult MRI sedation report high success rates when sedation is delivered by trained teams operating within established institutional frameworks (Verma et al., 2024). Stepwise escalation from oral to intravenous agents allows non-pharmacological measures to be exhausted before pharmacologic intervention is introduced.

A 2024 narrative review reported completion rates of approximately 93-94% for adult MRI examinations performed under monitored sedation, with these figures primarily derived from high-risk or selected patient populations who had previously experienced scan intolerance or high procedural anxiety, rather than from the general MRI population. The review also provides a detailed discussion of agent selection and risk mitigation strategies, including airway management, haemodynamic monitoring, and MRI-specific logistical considerations (Verma et al., 2024).

### *Governance and safety frameworks*

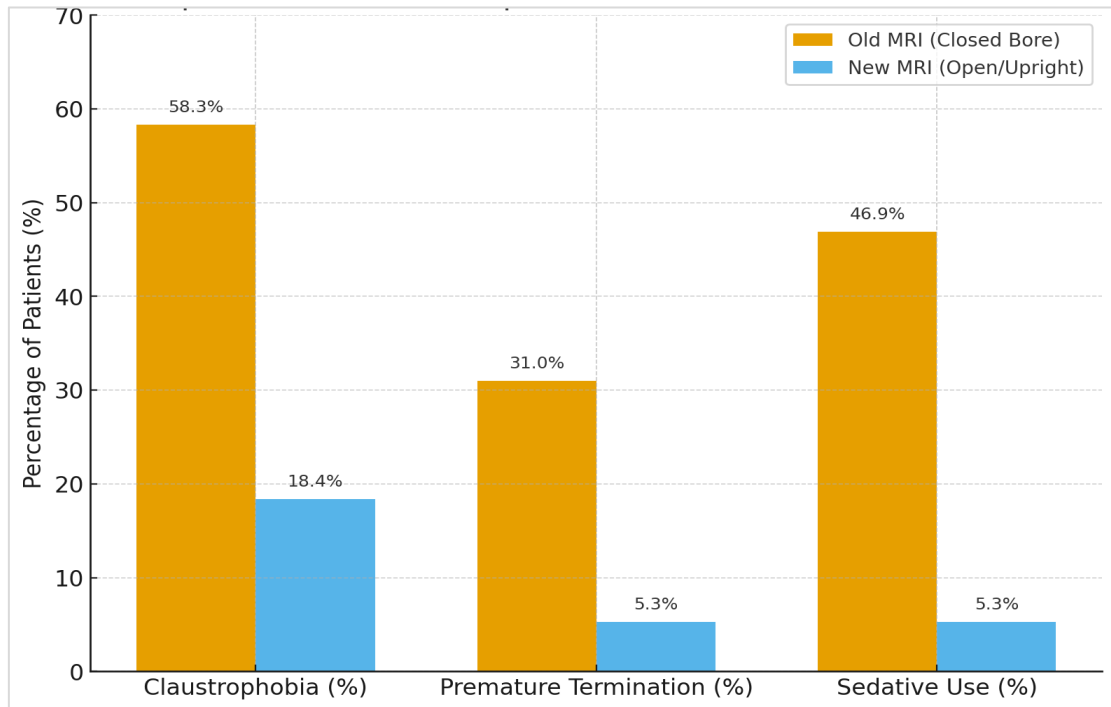
Professional guidance emphasises that sedation services must be supported by robust governance structures. The Royal College of Radiologists specifies the need for credentialed personnel, multidisciplinary oversight, and ongoing audit for sedation practices in radiology. Similarly, the Australian and New Zealand College of Anaesthetists (2023) guideline highlights that minimal or moderate sedation can unpredictably deepen, requiring practitioners to be competent in rescue and emergency management. Clear referral pathways, including pre-assessment, fasting instructions, and post-procedure escort policies, are integral to safe and sustainable sedation services (Constable et al., 2013).

### *Choice of sedative agents*

Recent observational studies comparing agents such as propofol and dexmedetomidine in adult MRI settings demonstrate differing profiles in terms of adverse events, recovery time, and physiological stability. These findings underscore the importance of individualised decision-making based on patient comorbidity, airway risk, and anticipated scan duration rather than a uniform sedation approach (Narayanan et al., 2024). In summary, pharmacological strategies are highly effective when non-drug interventions are insufficient. However, their success depends on well-governed systems, appropriately trained personnel, and access to comprehensive monitoring and resuscitation capabilities to ensure patient safety.

**Table 1. Summary of interventions to mitigate claustrophobia during MRI examinations.**

Domain	Key Elements	Implementation Notes and Key Evidence	Level of Evidence
<b>Psychological and experiential</b>	Structured pre-scan briefing and two-way communication; music or audiovisual distraction; mirrors or prism glasses	Cost-effective first-line interventions that improve comfort, reduce anxiety, and enhance compliance. Easily scalable across scanner types and service settings.	Systematic review and meta-analysis: Vieira et al., 2024 Observational study: Lawal et al., 2024 Qualitative study: Alvarez et al., 2024
<b>Hardware and environment</b>	Open or upright systems; short-bore scanners; enhanced airflow, lighting, and visual sightlines	Beneficial for selected high-risk patients. Bore diameter alone is not determinative and should be combined with communication and coping strategies.	Observational comparative study: Behluli et al., 2024 Observational study: Dostál et al., 2024
<b>Pharmacological</b>	Oral anxiolysis; monitored sedation (e.g., propofol, dexmedetomidine)	Associated with high scan completion rates when delivered within robust governance frameworks. Sedative choice should be individualised based on patient risk profile and scan duration.	Review article: Verma et al., 2024 Guideline: Royal College of Radiologists, 2024 Guideline: Australian and New Zealand College of Anaesthetists, 2023



**Figure 1. Comparison of patient experience in old and new MRI scanners (Behluli et al., 2024).**

## CONCLUSION

Synthesis of the literature published between 2020 and 2025 indicates a clear, evidence-informed hierarchy of interventions for managing MRI-related claustrophobia. Psychological and experiential measures, including brief structured explanations, continuous two-way communication, and music or audiovisual distraction, consistently demonstrate high impact at low cost by directly addressing core drivers of anxiety and perceived loss of control. These interventions can be operationalised as part of a “standardised experiential comfort bundle,” for example, by providing structured pre-scan briefings, offering patient-selected music or audiovisual content, and using mirrors or prism glasses to enhance spatial orientation. Despite their effectiveness, these approaches remain less systematically embedded in routine practice than investments in scanner technology or the use of sedation protocols. Hardware and environmental modifications, particularly open or upright systems, provide meaningful benefits for selected patients; however, increases in bore diameter alone are insufficient and should be implemented in conjunction with robust human factors strategies. Pharmacological approaches serve as a reliable escalation pathway, achieving high scan completion rates when delivered within contemporary governance, staffing, and safety frameworks.

To align clinical practice with current evidence, MRI services should adopt a structured, stepwise approach: first, implement a standardized experiential comfort bundle for all patients; second, apply brief screening and triage processes to identify individuals who may benefit from enhanced preparation or alternative hardware; and third, retain access to protocol-driven sedation for patients who remain unable to tolerate scanning. Future research should prioritize economic evaluations of triage-based scheduling to open or upright systems, randomized trials of standardized communication interventions in adult populations using completion and motion-related outcomes, and refinement of criteria for selecting patients most likely to benefit from immersive preparation or pharmacological support. Overall, a graduated strategy encompassing screening, communication, and distraction, targeted hardware use, and regulated sedation offers the most effective balance between patient experience, safety, and diagnostic quality in contemporary MRI practice.

### Conflicts of Interest

The authors declare no conflicts of interest.

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