Review Article

Recent advances in breast imaging reporting: a review of the BI-RADS® sixth edition

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ABSTRACT

The breast imaging reporting and data system (BI-RADS), developed by the American College of Radiology, serves as the cornerstone for standardized breast imaging interpretation and reporting. The Sixth Edition, released as the BI-RADS® v2025 Manual, represents a substantial evolution of the framework in response to advances in imaging technology, expanding clinical applications, and accumulated evidence highlighting limitations of earlier editions. This narrative review summarizes the major updates introduced in BI-RADS v2025 across mammography, ultrasound, magnetic resonance imaging, and contrast-enhanced mammography. Key revisions include refinement of breast density communication, formal integration of digital breast tomosynthesis-based lesion characterization, expanded ultrasound lexicon including non-mass lesions, elimination of ambiguous magnetic resonance imaging (MRI) terminology, incorporation of additional MRI descriptors, recognition of abbreviated MRI protocols, and elevation of contrast-enhanced mammography to a core modality. Collectively, these updates aim to improve reproducibility, harmonize reporting across modalities, and strengthen audit and quality assurance processes. Understanding these changes is essential for accurate interpretation, effective multidisciplinary communication, and consistent application in contemporary breast imaging practice.

Keywords: BI-RADS®, Breast imaging, Mammography, Ultrasound, Contrast-enhanced mammography, Reporting guidelines

INTRODUCTION

The breast imaging reporting and data system (BI-RADS) was developed by the American College of Radiology (ACR) in the early 1990s to improve the consistency of breast imaging reports and enhance communication between radiologists and referring clinicians. Originally devised for mammography interpretation, BI-RADS introduced a structured lexicon, assessment categories, and management recommendations aimed at reducing interpretive variability and standardizing reporting worldwide.[1,2] BI-RADS has since become integral to quality assurance, data collection, and clinical decision-making in breast imaging.

Early editions focused predominantly on mammography, but as imaging modalities such as ultrasound and magnetic resonance imaging (MRI) were increasingly adopted in clinical practice, the system expanded to include these techniques. The Fifth Edition, released in 2013, consolidated lexicons for mammography, ultrasound, and MRI into a single volume and emphasized standardized descriptors and final assessment categories.[3] Despite these improvements, several limitations persisted. Variations in report structure and descriptor usage across modalities continued to challenge consistency in multimodality interpretation and multidisciplinary care discussions.

Certain legacy descriptors remained poorly reproducible across readers, and the reporting system did not fully incorporate emerging technologies such as digital breast tomosynthesis (DBT), contrast-enhanced mammography (CEM), and abbreviated MRI protocols.[4,5] Additionally, regulatory changes in breast density reporting highlighted

the need for more standardized language and clearer guidance for patient communication.

To address these evolving needs, the ACR introduced the Sixth Edition of BI-RADS, released as the ACR BI-RADS® v2025 Manual. This edition represents a substantial reorganization and modernization of the framework, emphasizing harmonization of reporting structure across modalities, refinement of lexicon based on evidence, and enhanced audit capabilities to support performance monitoring and quality improvement. The aim of this narrative review is to examine the major updates introduced in BI-RADS v2025, explore the rationale behind these changes, and discuss their potential implications for contemporary breast imaging practice.

OVERVIEW OF BI-RADS 6TH EDITION (V2025)

One of the most significant conceptual changes in BI-RADS v2025 is the renaming of the traditional "BI-RADS Atlas" to the "BI-RADS manual". This shift reflects the transition from a primarily illustrative lexicon reference to a structured practice guideline that integrates lexicons, reporting logic, assessment recommendations, and audit standards into a unified document designed for everyday clinical use.[6] The v2025 manual expands substantially in scope and content compared with its predecessors, incorporating updated clinical images, expanded modality examples, and mechanisms for standardized reporting across diverse imaging techniques.[6]

A central goal of the sixth edition is harmonization of report organization across all imaging modalities. Previous editions sometimes exhibited variations in descriptor hierarchy, report sequencing, and assessment logic, which could lead to inconsistencies in multimodality interpretation and challenges in multidisciplinary tumor board discussions. BI-RADS v2025 addresses this issue by standardizing report sections to include clear elements such as clinical indication, technique, imaging findings, assessment, and management recommendations, regardless of modality. This harmonized structure improves clarity and facilitates more efficient communication between radiologists and referring clinicians.[6]

Another major advancement in the sixth edition is the formal integration of contrast-enhanced mammography (CEM) as a core modality within the manual. Historically, CEM reporting language existed as a supplement rather than a fully incorporated section. With increasing clinical use of CEM for problem-solving and staging due to its ability to combine functional enhancement patterns with morphological assessment, its elevation to a core modality reflects the need for standardized reporting language to support clinical decision-making and audit processes.[6]

In addition to modality-specific enhancements, BI-RADS v2025 introduces an enhanced audit and outcomes monitoring framework. By aligning definitions of screening and diagnostic examinations across modalities and incorporating updated performance benchmarks, the manual reinforces BI-RADS's role not only as a reporting lexicon but also as a tool for ongoing quality improvement and performance evaluation. These revisions support radiology practices in benchmarking their diagnostic accuracy and adherence to evidence-based standards, facilitating continuous quality assurance and accountability in breast imaging services.[6]

MAJOR UPDATES ACROSS MODALITIES

Mammography updates

Mammography remains the backbone of breast cancer screening, and updates in BI-RADS v2025 reflect both long-standing evidence gaps and advances in image acquisition technology. One of the most consequential revisions concerns breast density reporting. While breast density has been recognized as both a risk factor for breast cancer and a determinant of mammographic sensitivity for over two decades, studies have consistently demonstrated substantial interobserver variability in density assignment using earlier BI-RADS editions.[7,8]

The fifth edition provided categorical definitions but limited guidance on standardization, contributing to variability across readers and institutions. BI-RADS v2025 retains the four-category framework but emphasizes standardized phrasing and clearer alignment between professional reports and patient communication, responding to regulatory and clinical demands rather than introducing new biological assumptions.[6]

Another key mammographic update relates to digital breast tomosynthesis (DBT). Earlier BI-RADS definitions of a "mass" were developed in the context of two-dimensional mammography, requiring visualization on orthogonal views to confirm three-dimensionality. However, multiple studies have demonstrated that DBT improves lesion conspicuity, margin assessment, and depth resolution, allowing confident characterization of lesions that may only be apparent on a single tomosynthesis slice.[9-11] BI-RADS v2025 aligns its definitional criteria with this accumulated evidence, formally recognizing DBT-based lesion characterization and thereby reducing unnecessary recalls and supplemental imaging.

Calcification descriptors have also been refined. Prior validation studies have shown overlap in malignancy risk among certain morphologic calcification subtypes and significant reader variability in assigning etiology-based terms.[12,13]

BI-RADS v2025 responds by simplifying calcification terminology, prioritizing reproducible morphologic descriptors over historically entrenched but inconsistently applied terms. This refinement reflects a broader shift toward evidence-based lexicon optimization rather than semantic expansion.

Ultrasound updates

Breast ultrasound has evolved into a primary diagnostic modality in many clinical scenarios, particularly for dense breasts and symptomatic patients. Despite its widespread use, earlier BI-RADS editions provided limited guidance on background tissue characterization, even though multiple studies have demonstrated that background echotexture influences lesion detection and diagnostic performance.[14] BI-RADS v2025 introduces refined tissue composition descriptors to address this gap, enabling more standardized contextual interpretation of sonographic findings.

A major conceptual advancement in the Sixth Edition is the formal recognition of non-mass lesions on ultrasound. Prior literature has consistently described infiltrative or ill-defined sonographic abnormalities that do not meet strict criteria for a mass yet are associated with malignancy, particularly ductal carcinoma in situ and invasive lobular carcinoma.[15,16] The absence of standardized terminology for these findings in earlier BI-RADS editions contributed to inconsistent reporting and management. By incorporating non-mass lesions into the lexicon, BI-RADS v2025 harmonizes ultrasound terminology with MRI descriptors and improves descriptive precision.

Lymph node assessment has also been expanded. Earlier approaches often emphasized size thresholds, despite evidence showing that nodal morphology—such as cortical thickening, loss of fatty hilum, and abnormal vascularity—is more predictive of malignancy than size alone.[17-19] BI-RADS v2025 reorganizes lymph node evaluation into a dedicated framework encompassing intramammary, axillary, and regional nodes, reflecting contemporary oncologic imaging principles.

MRI updates

Breast MRI has undergone some of the most substantive conceptual refinements in BI-RADS v2025, reflecting its complexity and expanding clinical role. One of the most impactful changes is the elimination of the descriptor "focus." Multiple studies have documented poor interobserver agreement and inconsistent clinical management associated with this term.[6] Advances in spatial resolution now allow most enhancing foci to be characterized as either small masses or non-mass enhancement, rendering the term largely obsolete. BI-RADS v2025 formalizes this evolution, improving reporting clarity and reducing ambiguity.

The inclusion of T2 signal intensity as a mass sub-descriptor reflects growing evidence that T2 characteristics provide useful contextual information when interpreted alongside morphology and enhancement kinetics. Prior studies have demonstrated that uniformly T2-hyperintense masses with benign morphologic features are associated with a very low likelihood of malignancy.[6,20] BI-RADS v2025 incorporates this feature as supportive information

rather than a determinant of assessment category, appropriately balancing clinical utility with interpretive caution.

Peritumoral edema has also been introduced as an associated MRI feature. This is supported by investigations that have linked extensive peritumoral T2 hyperintensity with aggressive tumor biology, lymphovascular invasion, and increased nodal burden.[21-23] Its inclusion allows radiologists to convey biologically relevant information without altering standardized assessment categories.

Finally, BI-RADS v2025 formally acknowledges abbreviated breast MRI protocols. Multiple prospective studies have demonstrated that abbreviated protocols maintain high cancer detection rates while substantially reducing acquisition and interpretation time.[24-26] The manual's inclusion of minimum acquisition requirements reflects growing clinical adoption while recognizing ongoing debates regarding optimal implementation.

Contrast-enhanced mammography

The elevation of contrast-enhanced mammography (CEM) to a core BI-RADS modality represents a guideline-level response to a rapidly expanding evidence base. Meta-analyses and large cohort studies have demonstrated that CEM offers diagnostic performance comparable to MRI for lesion detection and staging in selected clinical contexts.[27-29] Despite this, earlier BI-RADS editions lacked standardized terminology for describing contrast enhancement patterns, limiting reproducibility and broader adoption.

BI-RADS v2025 addresses this limitation by integrating CEM into the core framework and harmonizing enhancement descriptors with MRI lexicon where appropriate. This approach is supported by prior studies demonstrating conceptual overlap between CEM and MRI enhancement patterns and advocating for unified reporting language.[18] Formal inclusion ensures that CEM findings are reported, assessed, and audited within the same standardized structure as other breast imaging modalities.

CLINICAL IMPLICATIONS OF BI-RADS V2025

The revisions introduced in BI-RADS v2025 have important implications for daily breast imaging practice, extending beyond terminological refinement to influence diagnostic confidence, workflow efficiency, and multidisciplinary communication. By harmonizing report structure across modalities, the Sixth Edition reduces cognitive load for both radiologists and referring clinicians, enabling faster interpretation of reports and more efficient correlation of findings across mammography, ultrasound, MRI, and contrast-enhanced mammography. This standardized structure is particularly valuable in multidisciplinary tumor boards, where rapid synthesis of multimodality imaging findings is essential for treatment planning.

The refinement of descriptors and elimination of poorly reproducible terms also directly address long-standing concerns regarding interobserver variability. Terms such as "focus" in MRI and ambiguous calcification descriptors in mammography were frequently cited sources of disagreement among readers, often leading to inconsistent follow-up recommendations. Their removal or redefinition reflects a deliberate effort to prioritize descriptors supported by reproducible imaging features and emerging evidence. This, in turn, improves consistency in BI-RADS assessment assignment and downstream patient management.

Another clinically meaningful advance is the clarification of BI-RADS category 6 usage. In earlier editions, ambiguity surrounding the classification of additional suspicious findings adjacent to known malignancies often resulted in inconsistent categorization as BI-RADS 4 or 5, even when such findings were unlikely to alter surgical management. The explicit guidance provided in v2025 allows radiologists to more accurately reflect clinical intent, improving alignment between imaging interpretation and surgical or oncologic decision-making.

The formal incorporation of contrast-enhanced mammography also has significant practical implications, particularly in settings where access to breast MRI is limited. By standardizing CEM interpretation and reporting, BI-RADS v2025 supports its responsible integration into diagnostic algorithms while maintaining consistency in assessment and audit metrics. This is especially relevant in resource-constrained environments, where CEM may serve as a viable alternative for lesion characterization or staging.

CHALLENGES IN IMPLEMENTATION

Despite its many strengths, the successful implementation of BI-RADS v2025 is not without challenges. One of the primary obstacles is the learning curve associated with revised terminology and reporting structure. Radiologists accustomed to legacy descriptors and report formats may require targeted education and practice-based training to ensure consistent adoption. This is particularly relevant for high-volume practices, where workflow efficiency is critical and deviations from established habits may initially slow reporting.

Another challenge lies in the variable availability of advanced imaging modalities. While BI-RADS v2025 integrates contrast-enhanced mammography and abbreviated MRI protocols, access to these technologies remains uneven across regions and institutions. In such settings, partial adoption of the updated framework may limit the full realization of its harmonization goals and complicate audit comparisons between centers.

Audit and outcomes monitoring, although strengthened in v2025, also present practical challenges. The expanded scope of audit data collection—including genetic risk factors, biomarker status, and outcomes for BI-RADS category 3 assessments—requires robust data infrastructure and institutional commitment. Practices lacking integrated reporting and registry systems may find comprehensive audit implementation resource-intensive, potentially limiting participation in advanced quality assurance initiatives.

Finally, while descriptor refinement improves standardization, some degree of subjectivity inevitably remains, particularly in areas such as T2 signal intensity assessment on MRI or morphologic lymph node evaluation. Continued education, peer review, and audit feedback will be essential to ensure consistent application of these descriptors in real-world practice.

FUTURE DIRECTIONS

BI-RADS v2025 represents a major step toward standardized, evidence-informed breast imaging reporting; however, it also lays the foundation for future evolution. One anticipated direction is the integration of artificial intelligence (AI) and quantitative imaging biomarkers into reporting frameworks. As AI tools increasingly assist in lesion detection, risk stratification, and workflow optimization, future BI-RADS iterations may incorporate guidance on the standardized reporting and auditing of AI-assisted interpretations.

Another important area for future development is international harmonization. Although BI-RADS is widely adopted globally, variations in practice patterns, resource availability, and regulatory environments persist. Continued collaboration between international radiology societies may help align BI-RADS principles with regional guidelines, promoting global consistency while allowing for contextual flexibility.

The expanding role of functional imaging techniques, including contrast-enhanced mammography and advanced MRI protocols, also suggests that future editions will further refine guidance on multimodality integration. As evidence accumulates regarding optimal use cases, diagnostic accuracy, and cost-effectiveness, BI-RADS is well positioned to incorporate data-driven refinements that balance innovation with standardization.

CONCLUSION

The BI-RADS® v2025 manual represents a comprehensive and thoughtful evolution of the breast imaging reporting framework. By addressing limitations of earlier editions, harmonizing terminology and report organization across modalities, and integrating emerging imaging techniques, the sixth edition strengthens BI-RADS' role as both a clinical and quality assurance tool. Its emphasis on standardized reporting, evidence-informed descriptor refinement, and enhanced audit capability supports improved diagnostic consistency, clearer

communication, and more meaningful outcome evaluation.

While challenges related to implementation, training, and resource availability remain, the overall impact of BI-RADS v2025 is expected to be substantial. As breast imaging continues to evolve, the sixth edition provides a robust foundation for consistent, patient-centered reporting and sets the stage for future innovations in breast cancer detection and management.

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