Saudi Journal of Medicine and Public Health

https://saudijmph.com/index.php/pub

https://doi.org/10.64483/202412823

Nursing Roles in Advanced Breast Imaging Pathways: Patient Preparation, Education, Procedural Support, and Follow-Up for Contrast-Enhanced Mammography, Tomosynthesis, and Supplemental MRI

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Abstract

Background: Advanced breast imaging, including contrast-enhanced mammography (CEM), digital breast tomosynthesis (DBT), and supplemental magnetic resonance imaging (MRI), is increasingly used for screening, diagnosis, and staging, yet the nursing contribution to these pathways is rarely described. **Aim:** To synthesize evidence on nursing roles in patient preparation, education, procedural support, and follow-up across these modalities. **Methods:** A narrative review of literature published from 2017 to 2024 was conducted, drawing on radiology, oncology, patient-safety, and health-communication sources, and organized into a pathway-based framework. **Results:** Nurses contribute to eligibility and risk screening, contrast safety, anxiety reduction, health-literacy-sensitive education, intravenous access and biopsy support, adverse-event management, result communication, and navigation. Nursing-specific evidence is limited; most support is extrapolated from imaging and navigation research. **Conclusion:** Structured nurse-led pathways may improve safety, experience, and continuity, but prospective evaluation is needed.

Keywords: breast imaging; contrast-enhanced mammography; digital breast tomosynthesis; breast MRI; oncology nursing.

Introduction

Breast cancer remains the most commonly diagnosed cancer among women worldwide and a leading cause of cancer death, which keeps early detection and accurate staging at the center of women's health services (Sung et al., 2021). Conventional two-dimensional mammography has been the foundation of population screening for decades, but its sensitivity is reduced in women with dense breast tissue, and breast density is itself an independent risk factor for cancer (Engmann et al., 2017). These limitations have driven the adoption of advanced imaging technologies that either improve lesion conspicuity through three-dimensional acquisition or add functional information through contrast enhancement.

Three technologies now dominate the advanced imaging conversation. Digital breast tomosynthesis (DBT) acquires multiple low-dose projections to reconstruct thin slices and reduces the masking effect of overlapping tissue; trial and registry data show higher cancer detection and, in many settings, lower recall than digital mammography alone (Conant et al., 2019; Zackrisson et al., 2018). Contrast-enhanced mammography (CEM) combines dual-energy acquisition with an intravenous iodinated contrast agent to display neovascularity, offering a functional readout on mammography equipment (Jochelson & Lobbes, 2021; Patel, Lobbes, et al., 2018b). Supplemental magnetic resonance imaging (MRI), including abbreviated protocols, uses gadolinium-based contrast and remains the most sensitive modality for high-risk surveillance, extent-of-disease assessment, and supplemental screening of women with extremely dense breasts (Bakker et al., 2019; Mann et al., 2022).

Professional guidance has progressively broadened the indications for these tests. The American College of Radiology recommends risk assessment no later than age 25 and supplemental imaging for many women at higher-than-average risk, and has addressed the role of tomosynthesis and supplemental modalities for women with dense breasts (Monticciolo et al., 2018, 2017). European guidance on breast MRI likewise details indications, technique, and quality requirements (Mann et al., 2022). As these examinations spread from specialist centers into routine practice, more patients encounter intravenous cannulation, contrast agents, prolonged positioning, and image-guided biopsy as part of what was once a brief screening visit.

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Receive Date: 22 December 2024, Revise Date: 30 December 2024, Accept Date: 31 December 2024

This shift has direct consequences for nursing. Advanced pathways add safety-critical steps, such as screening for contrast allergy and renal risk, as well as emotionally demanding moments, including waiting for an MRI result or undergoing a biopsy after a positive finding. They also add educational burdens: women must understand why a supplemental test is recommended, how density and risk interact, and what a recall or short-interval follow-up means. Nurses in radiology, breast care, and oncology settings are well placed to address these needs because they combine clinical assessment skills, procedural competence, and sustained patient contact. However, the literature on advanced breast imaging is dominated by diagnostic-accuracy studies and technical reviews, and the nursing contribution is usually implicit rather than analyzed.

The aim of this narrative review is to synthesize available evidence and expert guidance into a coherent description of nursing roles across four domains of the advanced breast imaging pathway: patient preparation, education, procedural support, and follow-up. The review focuses on CEM, DBT, and supplemental MRI, identifies where nursing practice is supported by direct evidence versus extrapolation, and proposes priorities for practice and research.

2. Methods

A narrative review design was chosen because the topic spans diagnostic imaging, contrast safety, patient education, oncology navigation, and psychosocial care, and because nursing-specific studies are too few and heterogeneous for a systematic synthesis. Narrative reviews allow integrative interpretation of diverse evidence, but they are more vulnerable to selection bias than systematic reviews, and this limitation is acknowledged below.

Literature published between January 2017 and December 2024 was considered, using PubMed, Scopus, and CINAHL-type keyword strategies combining terms such as contrast-enhanced mammography, contrast-enhanced spectral mammography, digital breast tomosynthesis, breast MRI, supplemental screening, nursing, radiology nursing, patient education, patient navigation, contrast media, and follow-up. Reference lists of key reviews and professional guidance documents were screened to identify additional sources. Peer-reviewed trials, systematic reviews, consensus statements, professional guidelines, and qualitative or patient-experience studies were eligible when they informed a nursing-relevant step in the pathway. Sources that addressed only image interpretation, technical physics, or machine learning without implications for patient care were excluded.

Because few studies evaluate nurse-led interventions in these specific modalities, the synthesis proceeded in three steps. First, nursing-relevant tasks were identified from procedural descriptions, safety guidance, and patient-experience findings. Second, tasks were mapped to four pathway phases, namely preparation, education, procedural support, and follow-up. Third, each task was classified by evidence source: direct imaging-pathway evidence, evidence from adjacent nursing or navigation research, or expert consensus. Findings are presented narratively and summarized in two tables and two figures. Where this review proposes a nursing role that is not explicitly tested in the cited studies, the text signals that the role is an inference from the evidence rather than an established outcome.

3. Advanced Breast Imaging Modalities and Their Nursing Relevance

3.1 Digital breast tomosynthesis

DBT is performed on a mammography unit with compression similar to conventional mammography, and no contrast agent is required. Large screening cohorts show that adding DBT to digital mammography raises cancer detection and can lower recall rates (Conant et al., 2019; Lowry et al., 2020), and a meta-analysis found that DBT combined with synthetic mammography performed comparably to DBT with digital mammography, supporting dose-sparing strategies (Alabousi et al., 2021). The Malmö trial reported higher detection with one-view DBT than with two-view digital mammography (Zackrisson et al., 2018). From a nursing perspective, DBT presents relatively modest procedural complexity. The principal needs concern comfort during compression, explanation of why additional views or recall may occur, and support for women who have implants, mobility limitations, or prior painful experiences. Nurses are therefore most visible in education and in recall communication rather than in preparation or procedural support.

3.2 Contrast-enhanced mammography

CEM requires intravenous injection of an iodinated contrast agent followed by dual-energy acquisition, and it generates low-energy images resembling standard mammograms together with recombined images highlighting enhancement (Jochelson & Lobbes, 2021). A systematic review of technique and protocols reported that adverse reactions are infrequent and mostly mild, although severe reactions have been documented, which supports the need for readiness to manage hypersensitivity (Zanardo et al., 2019). CEM has shown diagnostic performance comparable to MRI for lesion detection and extent-of-disease assessment in several comparisons (Fallenberg et al., 2017; Lee-Felker et al., 2017; Suter et al., 2020), and has been compared favorably with MRI for assessing residual disease after neoadjuvant therapy (Patel, Hilal, et al., 2018a). In a pilot comparison in women at increased risk, CEM identified cancers at a rate comparable to MRI (Jochelson et al., 2017), and in a cohort of women with dense breasts and intermediate risk, CEM detected additional cancers beyond mammography (Sorin et al., 2018). Radiation dose is higher than with

2D mammography but remains within accepted limits (James et al., 2017). For nurses, CEM combines the intravenous access, contrast safety screening, and extravasation risk of CT with the positioning demands of mammography, and these elements make nursing preparation and monitoring central to the safe delivery of the examination.

3.3 Supplemental MRI

Breast MRI uses gadolinium-based contrast and a dedicated coil, with the patient typically prone for 10 to 40 minutes depending on protocol. It is recommended for surveillance of women at high lifetime risk, staging of known cancer in selected situations, problem solving, and supplemental screening for women with extremely dense breasts (Mann et al., 2019, 2022; Heller & Moy, 2019). The DENSE trial showed that supplemental MRI in women with extremely dense breasts and a normal mammogram yielded a substantial incremental cancer detection rate and significantly fewer interval cancers (Bakker et al., 2019), and the second screening round confirmed a lower incremental yield with an acceptable false-positive rate (Veenhuizen et al., 2021). Abbreviated MRI protocols shorten acquisition and may improve access and tolerance (Chhor & Mercado, 2017), and the ECOG-ACRIN EA1141 trial found higher invasive cancer detection with abbreviated MRI than with DBT among women with dense breasts (Comstock et al., 2020). Nursing implications include MRI safety screening, claustrophobia management, cannulation, gadolinium safety, scheduling relative to hormonal and menstrual status as set out in guidance, and preparing women for the possibility of MRI-directed biopsy (Greenberg et al., 2020; Mann et al., 2022).

Table 1. Nursing-Relevant Characteristics of Advanced Breast Imaging Modalities

Feature	Digital breast tomosynthesis	Contrast-enhanced mammography	Supplemental MRI
Typical indications	Population screening; diagnostic work-up	Problem solving; staging; response assessment; selected high-risk or dense-breast screening	High-risk surveillance; staging; dense-breast supplemental screening; problem solving
Contrast agent	None	Iodinated (intravenous)	Gadolinium-based (intravenous)
Position and duration	Standing or seated; minutes	Standing or seated; several minutes after injection	Prone; approximately 10 to 40 minutes
Principal safety screening	Pregnancy status; implants	Prior contrast reaction; renal function; thyroid and medication history; pregnancy	MRI-unsafe devices; renal function; prior gadolinium reaction; pregnancy; claustrophobia
Main patient burden	Compression discomfort; recall anxiety	Cannulation; compression with contrast; potential reaction	Noise; confinement; cannulation; false-positive work-up
Dominant nursing contribution	Education; recall communication; comfort	Preparation; cannulation; monitoring; reaction readiness	Safety screening; anxiety management; cannulation; biopsy preparation

Note. Compiled from Conant et al. (2019), Jochelson and Lobbes (2021), Mann et al. (2022), Zanardo et al. (2019), and Greenberg et al. (2020).

4. Patient Preparation

4.1 Risk and eligibility assessment

Preparation begins before the patient arrives. Because eligibility for supplemental imaging depends on lifetime risk, breast density, personal and family history, prior chest radiation, and genetic status, accurate history-taking is a precondition for appropriate test selection (Monticciolo et al., 2018, 2017; Mainiero et al., 2017). Nurses who conduct pre-appointment calls or intake interviews can verify that the requested examination matches the indication, identify patients who might benefit from risk assessment, and flag discrepancies for radiologist or referrer review. This function is largely a patient-safety and appropriateness role: it prevents duplicate tests, unnecessary contrast exposure, and delays caused by incomplete information. Although few studies evaluate nurse-led triage specifically in breast imaging, guideline-based eligibility pathways in other cancer settings suggest that structured intake improves appropriateness and reduces missed risk factors (Dixit et al., 2021).

Dense breast tissue adds a communication dimension. Women told that they have dense breasts are often uncertain about the meaning of that information and about whether supplemental imaging is indicated, and expert panels have emphasized individualized, risk-based algorithms rather than universal supplemental testing (Berg et al., 2021). Nurses can ensure that notification letters are understood, that women know which supplemental options are available locally, and that referrals follow institutional criteria rather than patient anxiety alone.

4.2 Contrast safety screening

For CEM and MRI, contrast safety screening is the most clinically consequential nursing activity in the preparation phase. For iodinated agents used in CEM, the ACR Manual on Contrast Media recommends identifying prior contrast reactions,

relevant allergies, renal risk, and interacting conditions before administration, and prescribes the response to acute reactions (Güneş & Cesur, 2024). Consensus statements by the American College of Radiology and the National Kidney Foundation indicate that risk of contrast-associated acute kidney injury is low in patients with an estimated glomerular filtration rate of 30 mL/min/1.73 m² or higher and that screening intensity should be proportionate to risk (Davenport et al., 2020). For gadolinium-based agents, the same bodies support the use of group II agents with very low risk of nephrogenic systemic fibrosis, and note that routine renal screening may not be required for these agents in many patients (Weinreb et al., 2021). Concerns about gadolinium retention in the brain led to a summary of evidence which found no established clinical harm in patients with normal renal function, while recommending judicious use (Gulani et al., 2017). Nurses therefore play two roles: applying the screening algorithm correctly, and answering patient questions about retention and kidney safety using consistent, evidence-based language.

The nurse should also confirm pregnancy status and breastfeeding questions according to local policy, record medications such as metformin where relevant to institutional protocols, and document the screening outcome so that the radiologist and technologist can act on it. Where a patient reports a previous reaction, the nurse escalates to the supervising radiologist rather than deciding independently.

4.3 MRI safety and device screening

MRI introduces unique hazards from ferromagnetic objects, implanted devices, and thermal injury. The American College of Radiology guidance on MR safe practices stresses systematic screening of patients, implants, and accompanying persons, and the use of defined zones and trained personnel (Greenberg et al., 2020). Nurses commonly perform or verify the written screening form, confirm implant documentation, and remind patients to remove metallic items, patches, and hairpins. Tissue expanders with magnetic ports, pacemakers, and neurostimulators illustrate cases where documentation must be obtained before scheduling rather than on the day. Early screening by nursing staff reduces last-minute cancellations, which are costly and distressing, and strengthens the safety culture of the unit.

4.4 Physical, practical, and psychological readiness

Practical preparation includes advice on clothing, deodorant and lotion avoidance before mammography-based tests, hydration to ease cannulation, fasting only where the protocol requires it, and arrangements for transport and childcare. For premenopausal women, guidance on MRI timing within the menstrual cycle aims to reduce background parenchymal enhancement and false positives, and nurses can help schedule accordingly (Mann et al., 2022). Mobility, lymphedema risk in the arm to be cannulated after axillary surgery, and implant status should be assessed so that cannulation site and positioning are chosen safely.

Psychological readiness is equally important. In a study of women at high risk, many preferred CEM to MRI because of shorter duration and comfort, although preferences varied and some valued the absence of ionizing radiation with MRI (Phillips et al., 2017). This finding suggests that preparation should explore patient preferences and fears, including noise, confinement, needles, and radiation, rather than assume a uniform response. Qualitative synthesis of women's experiences of false-positive screening results shows that distress can persist after resolution and can influence future attendance (Long et al., 2019). Because supplemental imaging generates more recalls and biopsies, nurses can reduce later distress by explaining in advance that additional views, ultrasound, or biopsy are common and usually benign outcomes. For patients with claustrophobia, preparation may include a visit to the scanner room, a prone-position demonstration, breathing or imagery coaching, consideration of abbreviated protocols (Chhor & Mercado, 2017), and, where local policy permits, medical review for anxiolytic prescription with arrangements for safe transport.

5. Patient Education

5.1 Content of education across the pathway

Education is arguably the most distinctive and extensive nursing contribution because it spans every phase. Before the examination, patients need to understand the purpose of the test, why a supplemental or contrast-enhanced test has been recommended, what will happen, how long it will take, and what sensations to expect. During the examination, short explanations and consent-related dialogue help women remain still and cooperative. After the examination, patients need to know when and how results will be communicated, what recall means, and which symptoms after contrast or biopsy require contact. This content should reflect the modality: DBT education emphasizes compression and recall; CEM education emphasizes injection, timing of image acquisition, and the rare possibility of reaction (Jochelson & Lobbes, 2021; Zanardo et al., 2019); MRI education emphasizes noise, prone positioning, and the need to remain motionless (Mann et al., 2022).

In addition to procedural content, shared decision-making is a recurring theme. Commentary on screening has argued that women should be informed about benefits, harms, and uncertainties, including overdiagnosis and false-positive results, and that screening choices should reflect values and preferences (Keating & Pace, 2018). For supplemental screening, where evidence on mortality benefit is still maturing but detection and interval-cancer data are compelling, balanced information is particularly important (Bakker et al., 2019; Berg et al., 2021). Nurses, who often have more time with patients than

radiologists, can supply written and verbal information, check understanding, and communicate patient concerns to the clinician team.

5.2 Health literacy and communication strategies

Breast imaging terminology, including breast density categories, enhancement, recall, and BI-RADS assessments, is unfamiliar to many patients. Health literacy is increasingly recognized as a social determinant of health that shapes access, understanding, and outcomes, and responding to it requires both individual communication skills and organizational redesign (Nutbeam & Lloyd, 2021). In practice, nurses can use plain language, avoid acronyms, provide translated materials, and adapt formats for patients with low literacy, sensory impairment, or limited proficiency in the dominant language. Structured confirmation techniques are especially useful. A systematic review of the teach-back method found that it was associated with improved comprehension and, in several studies, better adherence and reduced anxiety, although implementation quality varied (Talevski et al., 2020). In imaging pathways, teach-back can be applied to preparation instructions, contrast aftercare, and follow-up plans.

Digital tools extend the reach of education but also introduce risk of inequity. Cancer care has seen rapid growth in digital health technologies, and a strategic approach to digital health literacy is needed so that patient portals, videos, and apps do not widen disparities (Kemp et al., 2021). Nurses can curate vetted resources, offer alternatives to those without digital access, and test whether patients can navigate online results and scheduling platforms.

5.3 Education about contrast agents, radiation, and false positives

Three topics generate frequent questions. The first is contrast safety: patients may have heard of gadolinium retention or iodine allergy and need accurate reassurance without minimization. Evidence-based summaries state that retention has not been linked to established harm in patients with normal renal function, but that data continue to evolve (Gulani et al., 2017; Weinreb et al., 2021). The second is radiation. CEM delivers more radiation than 2D mammography, yet estimates remain within regulatory standards, and the difference between modalities should be communicated numerically and in context (James et al., 2017). DBT dose varies with acquisition mode and the use of synthetic mammography (Alabousi et al., 2021). The third is the probability of false-positive findings. Supplemental MRI increases recalls and biopsies, and the benefit of earlier detection should be balanced with the possibility of additional testing (Veenhuizen et al., 2021; Heller & Moy, 2019). Preparing women for this possibility is a recognized way to reduce distress later (Long et al., 2019).

5.4 Education for special populations

Some groups require tailored education. Women with a known pathogenic variant or strong family history often undergo lifelong surveillance and carry distinct emotional burdens, including fear for relatives and anxiety around annual scans (Mann et al., 2019). Survivors undergoing surveillance imaging after treatment may face scanxiety, treatment-related symptoms, and altered anatomy. Women with implants require explanation of additional views and, for MRI, implant-related considerations. Patients with limited English proficiency, disabilities, or experiences of discrimination may mistrust systems or misinterpret instructions, which reinforces the need for interpreter services and culturally responsive communication. Patient navigation research in oncology indicates that individualized support can improve timeliness and reduce disparities, although effects depend on program design (Dixit et al., 2021), and similar principles can be applied to the supplemental imaging pathway.

6. Procedural Support

Figure 1 integrates the four domains of this review into a single pathway. Procedural support is the phase in which nursing activity is most visible and most safety-critical, because it coincides with intravenous access, contrast administration, positioning, and in some cases tissue sampling.

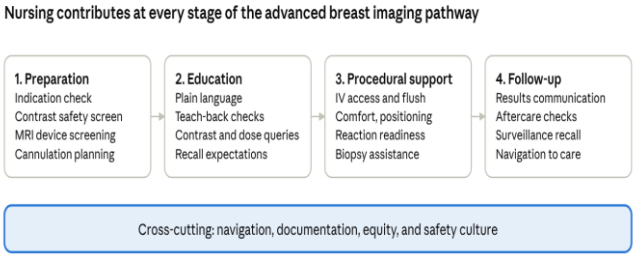


Figure 1. Nursing Roles across the Advanced Breast Imaging Pathway

6.1 Intravenous access, injection, and contrast monitoring

Both CEM and MRI depend on reliable venous access. Cannulation should use a site and device suitable for the injection rate, avoid an arm with axillary node dissection or lymphedema risk where feasible, and be checked for patency before contrast is given. CEM protocols describe acquisition within a defined time window after injection, so delays in access or positioning can compromise image quality and prolong compression (Jochelson & Lobbes, 2021; Zanardo et al., 2019). Extravasation, though uncommon, can cause pain, swelling, and tissue injury, and nurses are the staff most likely to detect early signs such as local swelling or patient-reported burning. Documentation of the lot number, volume, site, and time supports traceability and later review.

Because hypersensitivity reactions to iodinated and gadolinium agents can occur, the unit

must have a defined response plan, accessible emergency equipment, and staff trained to recognize and treat reactions, as set out in the ACR Manual on Contrast Media (Güneş & Cesur, 2024). Nurses commonly remain with the patient after injection, observe for urticaria, bronchospasm, or hypotension, and escalate immediately. A short observation interval and clear instructions about delayed reactions form part of safe discharge, particularly because CEM and MRI patients often leave the department quickly after imaging.

6.2 Comfort, positioning, and communication during imaging

In mammography-based examinations, compression pain is a common source of distress, and coaching, pacing, and clear explanation of the next step help women tolerate it. Women with prior mastectomy, implants, or limited shoulder mobility need adapted positioning. In MRI, women lie prone with the breasts in a coil; noise, confinement, and neck or shoulder discomfort can lead to motion artifact or an incomplete examination. Cushioning, an emergency call device, headphones, and continuous verbal contact are simple measures, and abbreviated protocols may be offered where clinically appropriate (Chhor & Mercado, 2017). Patient preference studies suggest that perceived burden strongly shapes willingness to repeat supplemental imaging, which gives comfort measures long-term relevance for adherence (Phillips et al., 2017).

6.3 Biopsy and image-guided intervention support

Supplemental imaging produces findings that require tissue diagnosis, including lesions seen only on tomosynthesis, CEM, or MRI. Nurses assist with identity and consent verification, review of anticoagulants and bleeding risk, positioning, aseptic technique, monitoring of vital signs and vasovagal symptoms, specimen handling, and post-procedure compression and wound care. Because MRI-guided biopsy requires prone positioning for extended periods and a limited emergency access environment, nursing vigilance and rehearsal of evacuation procedures are important (Greenberg et al., 2020; Mann et al., 2022). Communication during biopsy should be honest and calm, and the concordance and management language used afterward should align with BI-RADS categories to avoid contradictory messages (Spak et al., 2017).

Table 2. Illustrative Nursing Responsibilities by Pathway Phase and Modality

Phase	DBT	CEM	Supplemental MRI
Preparation	Verify indication, history, implants	Contrast allergy and renal screening; cannulation planning	Device and implant screening; renal and gadolinium screening; menstrual timing; anxiety assessment
Education	Compression, recall, density information	Injection, timing, reaction signs, radiation context	Noise, prone position, stillness, false-positive and biopsy expectations
Procedural support	Comfort and positioning	Cannulation; injection monitoring; reaction readiness	Cannulation; coil positioning; emergency communication; MRI-guided biopsy support
Follow-up	Recall communication; navigation to diagnostic work-up	Delayed reaction check; result communication	Result communication; short-interval follow-up; surveillance recall

Note. Synthesized from Güneş & Cesur (2024), Greenberg et al. (2020), Jochelson and Lobbes (2021), and Mann et al. (2022).

7. Follow-Up

7.1 Communicating results and managing recall

Follow-up begins with timely, comprehensible results. Because advanced imaging increases the number of abnormal findings that require additional views, ultrasound, or biopsy, recall communication is a core nursing task. Women who have had false-positive results describe fear, intrusive thoughts, and lingering worry, and some report altered attendance behavior (Long et al., 2019). Nurses can reduce harm by setting expectations about timing, using non-alarming but honest language, offering immediate access to a named contact, and ensuring that appointments for diagnostic work-up are made promptly. Interval cancers and missed appointments represent the clinical cost of poor follow-up, and understanding why cancers arise between screens reinforces the need for adherence and symptom awareness (Houssami & Hunter, 2017).

7.2 Aftercare and delayed adverse effects

After contrast administration, nurses can advise on hydration, symptoms of delayed skin reactions, and when to seek urgent help, and can confirm that patients know how to contact the department. After biopsy, instructions cover bleeding, bruising, infection, activity limits, and analgesia. For women with kidney disease or other risk factors identified at screening, follow-up may involve confirmation that no adverse renal events occurred, consistent with consensus guidance on risk-proportionate monitoring (Davenport et al., 2020; Weinreb et al., 2021). Reporting contrast reactions to the radiologist and recording them in the medical record protect future patients.

7.3 Surveillance, recall scheduling, and continuity

High-risk women need annual surveillance, often alternating or combining MRI and mammography-based tests, and their adherence depends on reminders, convenient scheduling, and trust (Mann et al., 2019; Monticciolo et al., 2018). For women with extremely dense breasts who undergo supplemental MRI, repeat rounds show lower incremental yield but continued benefit in some settings, which supports structured recall for those who elect ongoing supplemental screening (Veenhuizen et al., 2021). Patients receiving neoadjuvant therapy may undergo CEM or MRI for response assessment, and nurses coordinate timing around treatment cycles and communicate results with the oncology team (Patel, Hilal, et al., 2018a). Navigation programs that assign a named nurse or navigator can improve timeliness, reduce loss to follow-up, and support equity, although evidence from oncology navigation indicates that effects depend on resources, training, and targeting (Dixit et al., 2021).

8. Cross-Cutting Themes

8.1 Interprofessional communication and documentation

Safe advanced imaging depends on clear communication among radiologists, technologists, referring clinicians, and nurses. Nurses frequently act as the link, relaying clinical history to the radiologist, carrying patient concerns back to the team, and ensuring that safety screening is documented in a consistent, retrievable format. Standardized checklists, structured intake forms, and clear escalation rules reduce variation and are consistent with guidance on MR safety and contrast management (Güneş & Cesur, 2024; Greenberg et al., 2020).

8.2 Equity, access, and patient-centered care

Advanced modalities are not equally available, and differences in insurance, geography, language, and health literacy affect who is offered supplemental imaging. Nurses can help detect and reduce these gaps by ensuring that information is accessible, that eligibility criteria are applied consistently, and that patients who are anxious or less confident are not left to self-navigate (Dixit et al., 2021; Nutbeam & Lloyd, 2021). Digital scheduling and results portals should be accompanied by alternatives for patients with limited access or skills (Kemp et al., 2021).

8.3 Competency and training

The expansion of CEM and abbreviated MRI means that many nurses will be working with new equipment and protocols. Competencies should include contrast pharmacology and reaction management, cannulation and extravasation care, MRI safety, breast anatomy and BI-RADS terminology, communication skills for distressing news, and basic risk assessment. Simulation of contrast reactions and MRI emergencies, supervised biopsy assistance, and communication training with feedback are practical methods, although the effectiveness of specific programs in breast imaging has not been well evaluated.

9. Synthesis, Evidence Gaps, and Implications

The pathway view suggests that nursing contributions differ in intensity by modality but converge on the same functions: safety, comprehension, comfort, and continuity. DBT places the heaviest demand on communication and recall management; CEM adds contrast and monitoring responsibilities within a mammography setting; and supplemental MRI combines the greatest preparation and anxiety-management load with the highest likelihood of further work-up. Figure 2 illustrates why this matters for staffing and education. Supplemental MRI studies report the highest yields of additional cancer detection, which also means more patients passing through recall and biopsy pathways, whereas CEM and DBT yields are smaller but are delivered through mammography workflows that serve high volumes (Bakker et al., 2019; Comstock et al., 2020; Sorin et al., 2018; Veenhuizen et al., 2021). Detection gains and false-positive burden therefore travel together, and nurses sit at the point where that trade-off is experienced by patients.

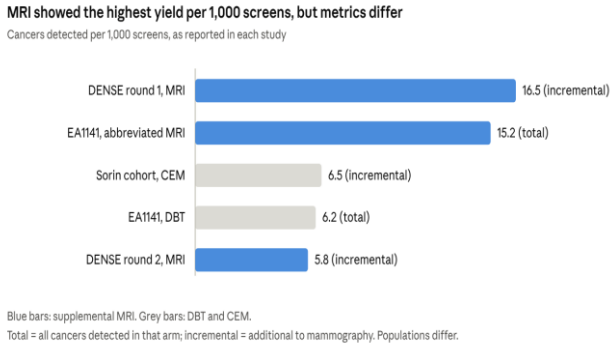


Figure 2. Reported Cancer Detection per 1,000 Screens in Selected Advanced Imaging Studies
Rates as reported in Bakker et al. (2019), Veenhuizen et al. (2021), Comstock et al. (2020), and Sorin et al. (2018)

Several gaps limit confident recommendations. First, few studies evaluate nurse-led interventions in advanced breast imaging, so effects on safety events, anxiety, adherence, and cost are largely unmeasured. Second, patient-reported experience measures for CEM and abbreviated MRI are scarce, and the preference data that exist come from small samples (Phillips et al., 2017). Third, optimal staffing ratios, competency standards, and escalation protocols are rarely published. Fourth, equity-focused studies of who receives supplemental imaging, and of how nursing navigation might alter this, are limited (Dixit et al., 2021). Priorities for research include prospective evaluation of nurse-led preparation and education bundles, trials of teach-back and digital tools in imaging settings, and registry-based monitoring of contrast reaction management.

For practice, units introducing advanced imaging should define nursing roles in written pathways, adopt structured contrast and MRI safety checklists, train staff in communication about density, risk, and recall, and designate a point of contact for patients awaiting results. Organizations should also audit loss to follow-up after recall and make results and aftercare information accessible to patients with differing literacy and digital access.

10. Limitations

This review has several limitations. A narrative design without a registered protocol, formal quality appraisal, or exhaustive database coverage increases the risk of selection bias, and the 2017 to 2024 window excludes earlier foundational studies. Few included sources address nursing directly, so many nursing roles are inferred from imaging guidance, patient-experience research, and navigation literature rather than from outcome studies. Findings from trials in specific populations, such as women with extremely dense breasts, may not generalize to all settings, and practice varies by country, regulation, and the scope of nursing licensure. The proposed framework in Figure 1 is conceptual and has not been validated.

11. Conclusion

As contrast-enhanced mammography, digital breast tomosynthesis, and supplemental MRI become embedded in screening and diagnostic care, nurses hold a central and under-described role in making these pathways safe, understandable, and humane. Across preparation, education, procedural support, and follow-up, nursing practice protects patients from contrast and MRI hazards, translates complex information into usable understanding, reduces distress during demanding procedures, and sustains continuity after abnormal or uncertain results. Current evidence supports these roles chiefly through imaging guidelines and adjacent research rather than direct nursing trials. Health systems should therefore formalize nursing roles, invest in training, and evaluate outcomes prospectively so that advances in imaging technology translate into better patient experience and earlier, equitable cancer detection.

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