Artificial Intelligence in Breast Cancer Screening and Radiology

A Comprehensive Systematic Review

Aman Agarwal | Omkar Ravi Kachawar
Hitik R. Sharma | Disha Gujarati

EEU Medical Doctor Program Students | 2026-27

Agenda

- 1. Background & Global Burden of Breast Cancer
- 2. Research Objectives & Methodology
- 3. Author Contributions
- 4. AI Diagnostic Performance (Aman Agarwal)
- 5. Landmark Clinical Trials (Omkar Kachawar)
- 6. Population-Based Outcomes (Hitik Sharma)
- 7. Key Findings & Results
- 8. Implications & Future Directions
- 9. What We Learned

Global Burden of Breast Cancer

Critical Statistics:

- • 2.3 million new diagnoses annually worldwide
- • Over 665,000 deaths each year
- • Most common cancer in women globally

Current Challenges:

- • Traditional double-reading is labor-intensive
- • Global shortage of radiologists
- • Need for improved screening efficiency

Research Objectives

Objective 1

Clinical, diagnostic and implementation issues of AI

(Aman Agarwal)

Objective 2

AI performance in landmark prospective & randomized trials

(Omkar Kachawar)

Objective 3

Large-scale population data on workload reduction & workflow

(Hitik Sharma)

Research Methodology

PRISMA 2020 Guidelines

- • Three complementary systematic reviews
- • Analysis period: 2015-2025
- • Over 85 peer-reviewed studies
- • Three landmark prospective/randomized trials

Key Trials:

- • ScreenTrustCAD (n=55,581)
- • ScreenTrustMRI
- • MASAI

85+
Peer-Reviewed Studies

3
Landmark Clinical Trials

10 Years of Research

Author Contributions: Aman Agarwal

Systematic Narrative Review (2015-2024)

Focus Areas:

- • AI-based applications in breast radiology
- • Diagnostic performance studies
- • Breast density assessment
- • Risk prediction models
- • Explainable AI (XAI)
- • Human-AI user interaction

Methodology: PRISMA 2020 guidelines

Author Contributions: Omkar Ravi Kachawar

Critical Appraisal of Clinical Trials

Three Groundbreaking Studies:

1. ScreenTrustCAD Trial
AI-based mammography screening (n=55,581)

2. ScreenTrustMRI Trial
Selecting people for supplemental MRI using AI

3. MASAI Trial
AI-assisted vs. standard double reading

Author Contributions: Hitik R. Sharma

Population-Based Implementation Analysis

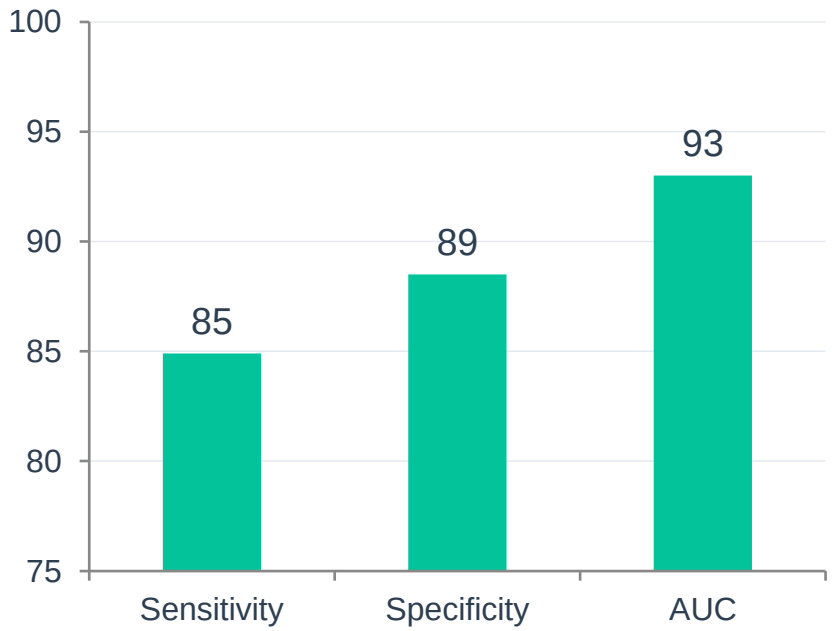
Focus on Real-World Impact:

- • Cancer detection rates in population screening
- • Radiologist workload reduction
- • Screening workflow efficiency
- • Implementation challenges

Data Sources:

- • Large-scale population studies
- • Nationwide implementation data
- • Multi-center validation studies

AI Diagnostic Performance



Key Findings:

- • Mean sensitivity: 84.9%
- • Mean AUC: 0.93
- • Non-inferior to double reading
- • Comparable specificity

ScreenTrustCAD Trial: Landmark Results

Study: n = 55,581 participants | Non-inferiority trial | Published: Lancet Digital Health 2023

Non-Inferiority Confirmed

1.04

Relative proportion (95% CI: 1.00-1.09)

Safe Substitution

✓

AI can replace one radiologist safely

Detection Rate

Equal

Comparable to double reading

Population-Based Outcomes

+17.6%

Cancer Detection Rate

49%

Workload Reduction

No ↑

False Recall Rates

Clinical Benefits:

- • Improved cancer detection without increasing false positives
- • Significant reduction in radiologist reading workload
- • Enhanced workflow efficiency in population screening
- • Maintained diagnostic quality with reduced resources

Key Findings Summary

Diagnostic Performance:

- • Mean sensitivity: 84.9%
- • Mean AUC: 0.93
- • Non-inferior to double reading

Clinical Validation:

- • ScreenTrustCAD: Safe substitution confirmed
- • 55,581 participants studied
- • Relative proportion: 1.04 (95% CI: 1.00-1.09)

Population Impact:

- • +17.6% cancer detection rate
- • 49% workload reduction
- • No increase in false recalls

Workflow Benefits:

- • Enhanced efficiency
- • Reduced radiologist burden
- • Maintained quality standards

Clinical Implications

AI-Assisted Mammography is Clinically Justified:

✓ **Improved Detection Accuracy**
Higher cancer detection rates without increasing false positives

✓ **Reduced Radiologist Workload**
49% reduction addresses global radiologist shortage

✓ **Enhanced Workflow Efficiency**
Faster screening with maintained quality standards

✓ **Safe Implementation**
Validated in large prospective trials

Future Directions & Recommendations

Areas for Further Research:

- • Diverse training datasets
- • Model explainability (XAI)
- • Long-term outcome studies
- • Cost-effectiveness analysis
- • Multi-modal integration
- • Real-world implementation challenges

Implementation Needs:

- • Regulatory frameworks
- • Ethical guidelines
- • Quality assurance protocols
- • Training programs for radiologists
- • Data privacy protections
- • Equity in access

What We Learned Through This Research

Research Skills & Methodology:

- • Mastered PRISMA 2020 systematic review guidelines
- • Learned critical appraisal of clinical trials
- • Developed skills in synthesizing large volumes of research

Clinical Understanding:

- • Deep understanding of breast cancer screening challenges
- • Appreciation for radiologist workflow and workload
- • Recognition of real-world implementation barriers

Technology & Medicine:

- • AI can complement but not replace human expertise
- • Importance of rigorous validation before clinical adoption

How We Learned: Our Research Journey

1

Literature Search

Systematic database searches (PubMed, Scopus)

2

Critical Reading

Analysis of 85+ peer-reviewed studies

3

Data Extraction

Systematic data collection using PRISMA

4

Synthesis

Integration of findings across studies

5

Collaboration

Team discussions and peer review

6

Validation

Cross-checking with landmark trials

Key Personal Insights

Interdisciplinary Collaboration

Combining clinical knowledge with technical understanding of AI systems

Evidence-Based Medicine

Importance of rigorous trials before clinical implementation

Future of Healthcare

AI as a powerful tool to augment, not replace, human expertise

Conclusion

AI-assisted mammography screening is clinically validated
and ready for broader implementation in population-based programs.

With continued research and proper oversight,
AI has the potential to transform breast cancer screening worldwide.

Thank You

Questions & Discussion

Authors:
Aman Agarwal | Omkar Ravi Kachawar | Hitik R. Sharma | Disha Gujarati

EEU Medical Doctor Program Students | 2026-27