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AI-Assisted CTA Review Improves Rule-Out Performance in Real-World Vessel Occlusion Detection

Ochsner Health

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Background

Vessel Occlusion Detection Requires Balancing Sensitivity and Specificity

- The study focused on whether AI assistance could reduce missed vessel occlusions (VOs) in routine clinical practice
- The target operating point emphasized higher sensitivity and stronger rule-out performance
- A sensitivity-focused strategy may identify more occlusions but can also increase false positive flags
- The clinical value of AI was therefore assessed across multiple complementary diagnostic metrics

Purpose

Determine Whether AI-Assisted CTA Review Improves Missed Occlusion Reduction

- Evaluate AI-assisted CTA review for VO detection in real-world practice
- Compare unaided radiologist interpretation with AI plus radiologist review
- Determine whether AI shifts performance toward a higher sensitivity, higher rule out operating point
- Characterize the accompanying changes in specificity, PPV, accuracy, and AUC

Methods

Retrospective Review of 1,473 Real-World Cases

- Retrospective analysis of 1,473 cases
- Study period: November 15, 2023, through April 14, 2024
- Clinical interpretation was evaluated under two review conditions:

Unaided radiologist review

AI-assisted radiologist review

- The analysis assessed diagnostic performance for vessel occlusion detection

Methods

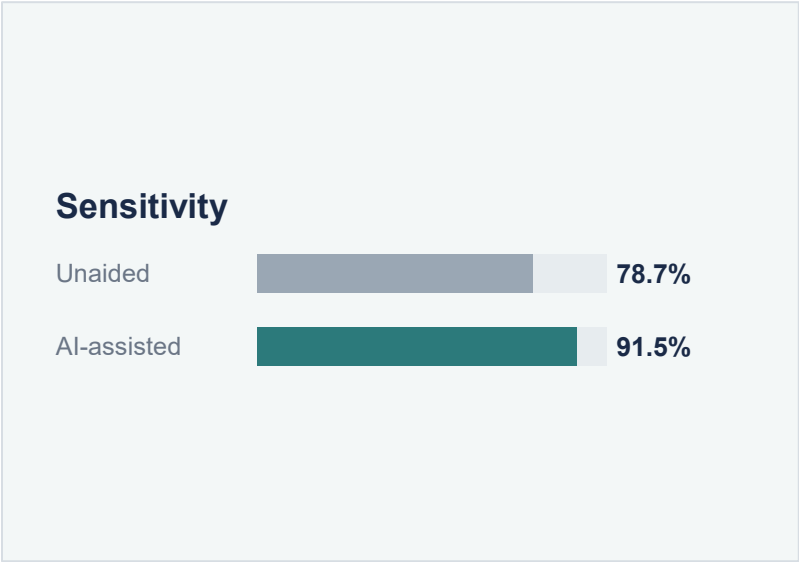
Evaluate Detection, Rule Out, and Overall Discrimination

Sensitivity:	ability to identify VOs
Specificity:	ability to correctly identify cases without VO
PPV:	probability that a positive result represented an occlusion.
NPV:	probability that a negative result represented the absence of occlusion
Accuracy and AUC:	overall classification performance and discrimination

Results

AI Assistance Increased Sensitivity by 12.8 Percentage Points

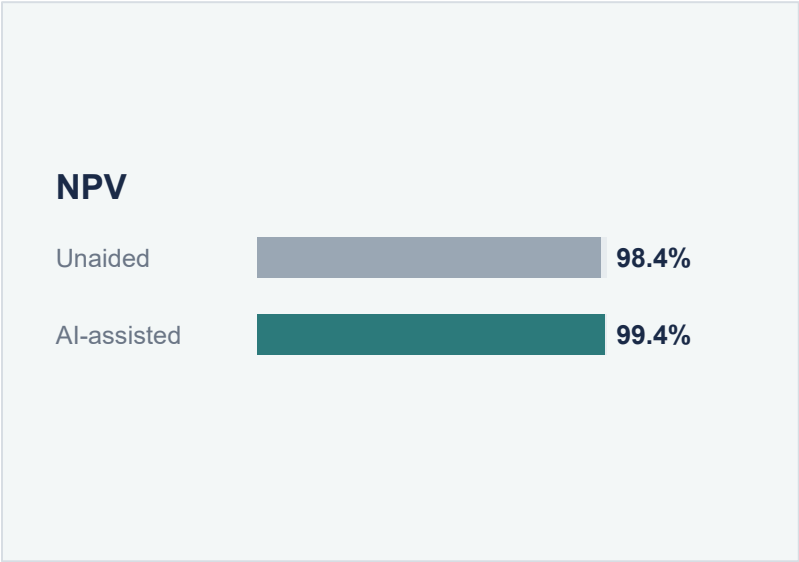
- Sensitivity increased from 78.7% with unaided radiologist review to 91.5% with AI-assisted review
- This represents a 12.8 percentage point increase in sensitivity
- The higher sensitivity indicates fewer missed VOs
- The improvement directly supported the study's primary emphasis on missed-occlusion reduction



Results

AI Assistance Improved Negative Predictive Value

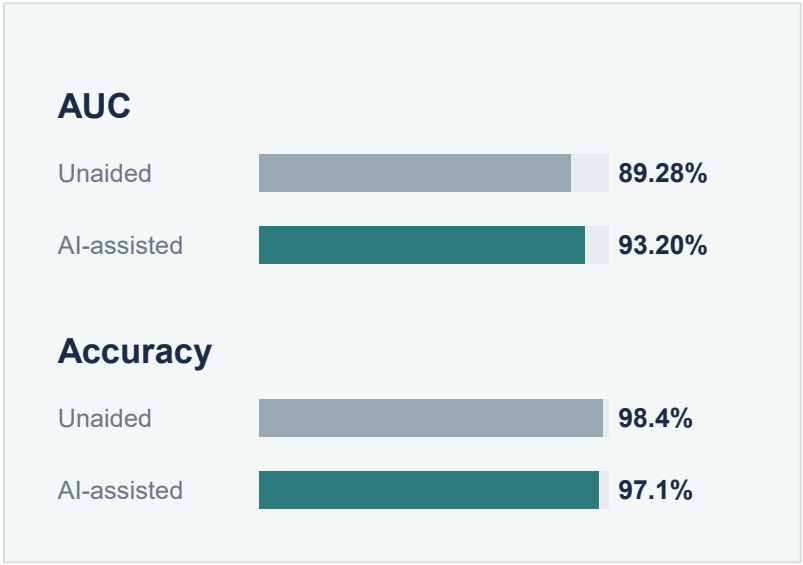
- NPV increased from 98.4% with unaided review to 99.4% with AI-assisted review
- The 1.0 percentage-point increase indicates stronger rule-out confidence
- Higher sensitivity and NPV together supported a safer negative assessment for vessel occlusion
- These findings support AI assistance when minimizing missed occlusions is the primary goal



Results

AI Assistance Improved AUC but Slightly Reduced Overall Accuracy

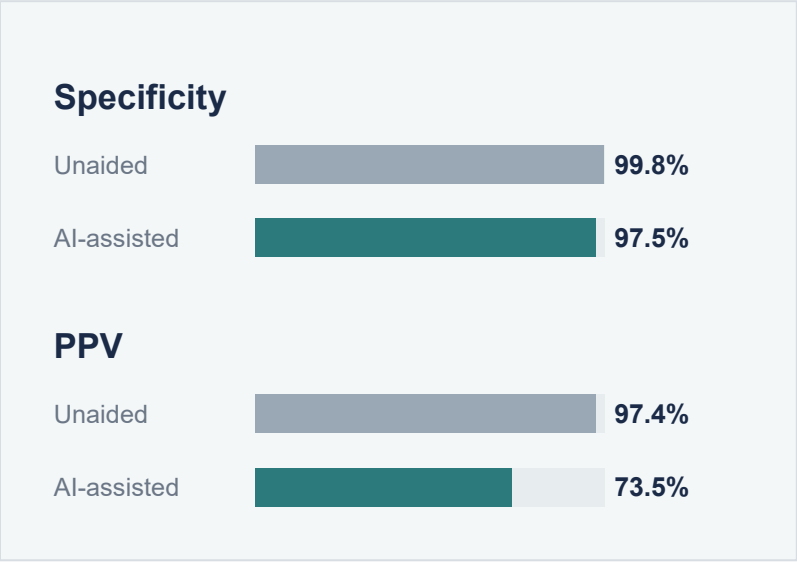
- AUC increased from 89.28% with unaided review to 93.20% with AI-assisted review
- Overall accuracy changed from 98.4% to 97.1%
- The higher AUC indicates improved overall discrimination between occlusion and non-occlusion cases
- The small decrease in accuracy reflects the broader shift toward sensitivity and missed occlusion reduction



Results

Sensitivity Gains Were Accompanied by More False Positive Flags

- Specificity decreased from 99.8% to 97.5%
- PPV decreased from 97.4% to 73.5%
- The lower specificity and PPV indicate more false positive flags with AI-assisted review
- This tradeoff was expected when shifting toward a higher sensitivity operating point



Results

The Overall Operating Point Shifted Toward Rule-Out Performance

Improved with AI assistance:

Sensitivity: 78.7% → 91.5%

NPV: 98.4% → 99.4%

AUC: 89.28% → 93.20%

Decreased with AI assistance:

Specificity: 99.8% → 97.5%

PPV: 97.4% → 73.5%

Accuracy: 98.4% → 97.1%

The results demonstrate a shift toward fewer missed occlusions and stronger rule-out confidence

Clinical Interpretation

AI's Main Value Was Safer Detection Support

- AI-assisted review improved sensitivity, AUC, and NPV in this real-world health system cohort
- The performance shift favored detection support and enhanced rule-out performance
- Reduced specificity and PPV indicate that AI assistance did not preserve a highly restrictive alert profile
- Interpretation of positive flags should account for the increased false positive burden

Conclusion

AI-Assisted CTA Review Supported Missed Occlusion Reduction

- AI-assisted review increased sensitivity from 78.7% to 91.5%
- AI-assisted review also improved AUC from 89.28% to 93.20% and NPV from 98.4% to 99.4%
- These improvements support its use when minimizing missed vessel occlusions is the primary clinical objective
- The principal tradeoff was reduced specificity and PPV, consistent with more false positive flags

> Take-home message: AI-assisted CTA review shifted real-world performance toward safer detection and stronger rule out confidence