



P1.094 : AI-Concurrent Reading Is Non-Inferior to Double Reading for Lung Nodule CT : A Multi-Reader Study

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INTRODUCTION

Double reading improves lung nodule detection on CT^{1,2} but is resource-intensive and impractical in many clinical settings.

AI-assisted diagnosis of pulmonary nodules in LDCT contributes to improving the diagnostic performance of radiologists and reducing their burden of image interpretation^{3,4}.

AI-assisted reading — delivered either after interpretation (AI-Second, AIS) or simultaneously (AI-Concurrent, AIC) — may enable single-reader workflows with equivalent diagnostic performance.

However, non-inferiority of AI-assisted single reading versus double reading has not been rigorously established across diverse reader pairings.

We evaluated whether AI-assisted single reading by specialist and non-specialist radiologists is non-inferior to double reading in case-level sensitivity, nodule-level sensitivity, and specificity.

METHODS

Design

Multi-reader observer study; each reader interpreted every case under all three conditions.

Cases

75 chest CT cases — 61 positive (196 nodules) and 14 negative.

Readers

9 radiologists: 4 specialists (S) and 5 non-specialists (N).

Conditions

NoAI, AI-Second (AIS), AI-Concurrent (AIC).

AI support was provided by Plus.Lung.Nodule.

Reference baselines

Five double-reading configurations:

All S×N combinations (S+N, 20 pairs),

rank-matched diagonal pairings (S+N-A/B, 4 pairs each),

S×S (S+S, 6 pairs), N×N (N+N, 10 pairs).

Endpoints

Primary: case-level sensitivity non-inferiority versus double reading (NoAI, OR-rule; margin $\Delta = -0.05$), bootstrap 95% CI (10,000 iterations).

Secondary: nodule-level sensitivity and specificity.

Statistics

Superiority: one-sided Mann-Whitney U test. Sensitivity analyses at $\Delta = -0.04$ and -0.03 .

DISCUSSION AND CONCLUSION

AIC single reading was non-inferior to all evaluated two-reader configurations in case-level and nodule-level sensitivity, with specificity maintained.

Non-specialists using AIC achieved non-inferiority against specialist-inclusive two-reader interpretation — while AIS did not.

This supports AI-Concurrent reading as a viable replacement for two-reader interpretation in lung nodule CT screening, particularly where specialist availability is limited.

Additionally, specialist readers using AI demonstrated nodule-level superiority over two-reader interpretation, suggesting potential for further performance gains beyond workload reduction.

REFERENCES & ACKNOWLEDGEMENTS

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Disclosure

The AI system evaluated in this study (Plus.Lung.Nodule) was provided by Plusman LLC, Tokyo, Japan. All analyses were performed by Nagasaki University.

No AI was used in this study

References

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RESULTS

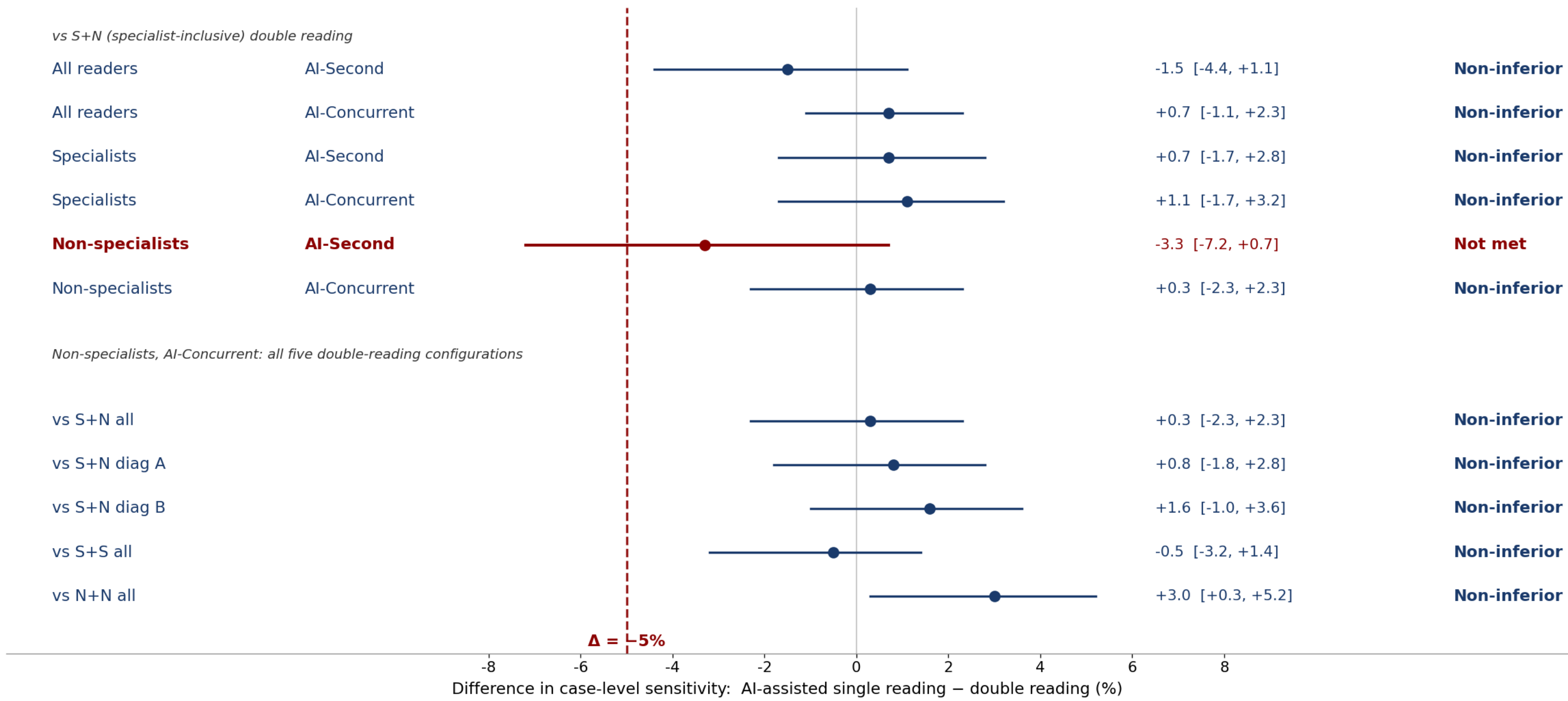
Non-specialists using AI-Concurrent matched specialist-inclusive double reading

93.4% vs 93.1% — while AI-Second did not reach non-inferiority

Table 1. Case-level sensitivity / specificity (%)

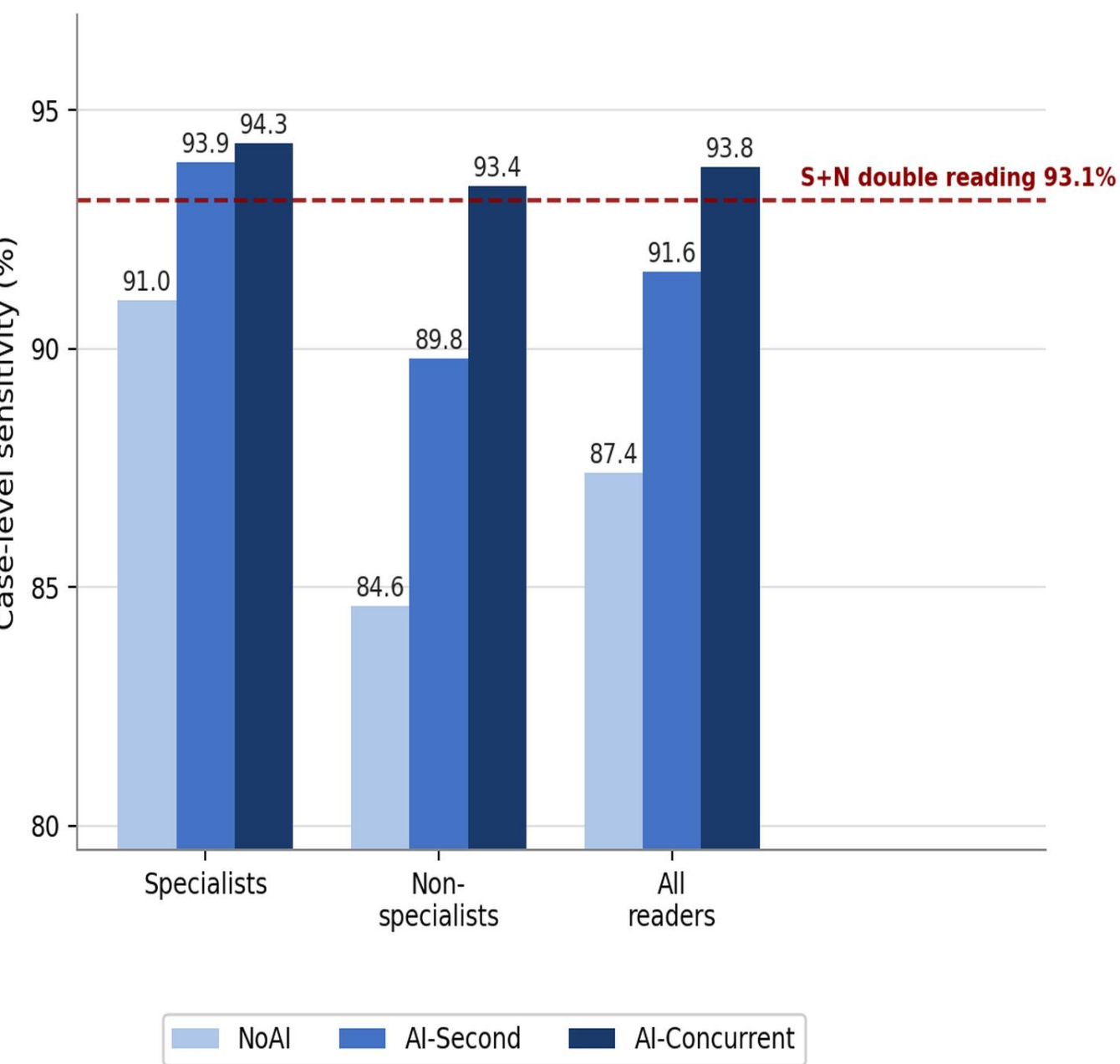
Reader group	NoAI	AI-Second	AI-Concurrent
Specialists (n=4)	91.0 / 89.3	93.9 / 85.7	94.3 / 91.1
Non-specialists (n=5)	84.6 / 92.9	89.8 / 92.9	93.4 / 88.6
All readers (n=9)	87.4 / 91.3	91.6 / 89.7	93.8 / 89.7

Figure 1. Non-inferiority against double reading (primary endpoint, $\Delta = -5\%$)



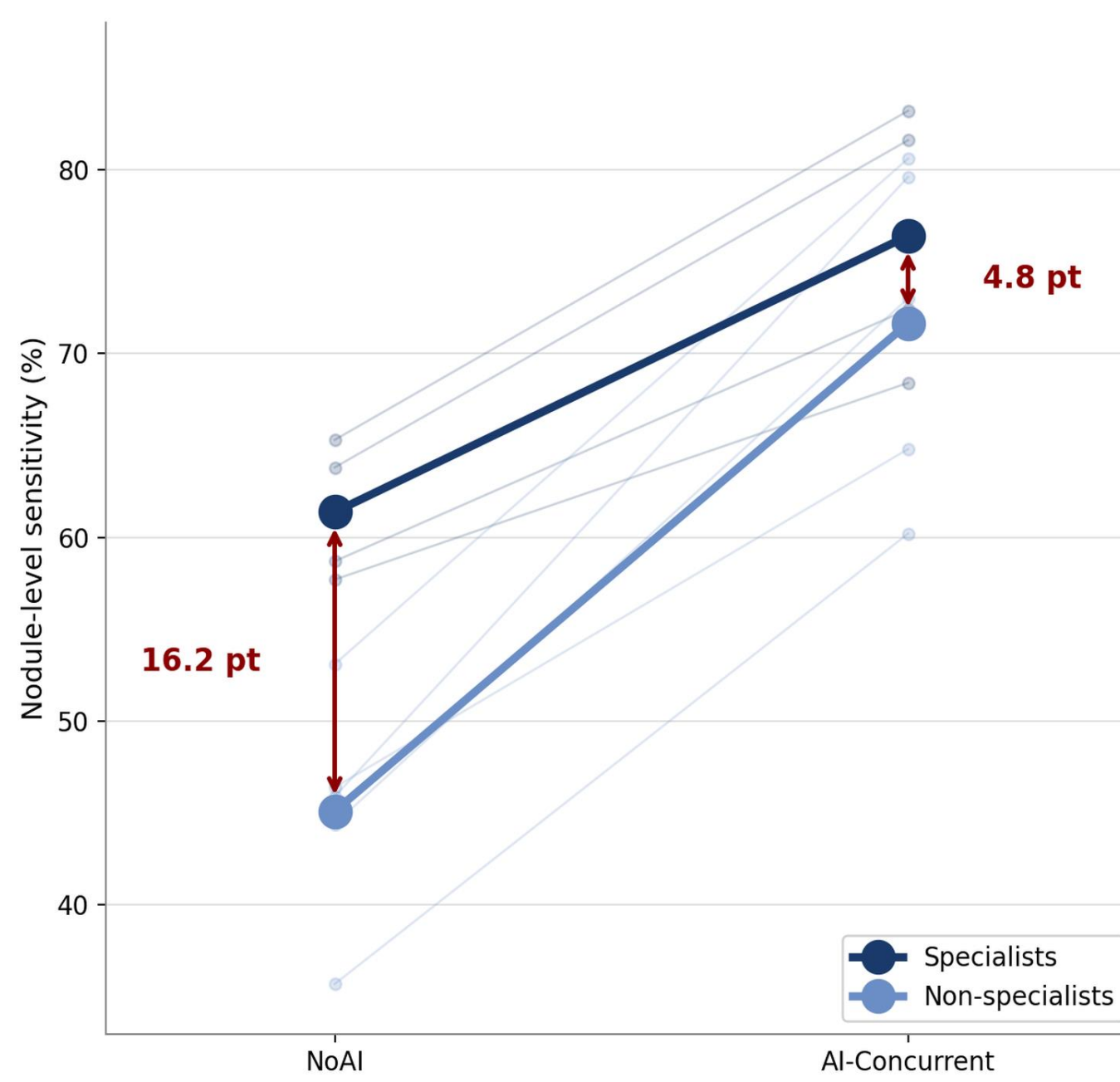
Differences in case-level sensitivity with bootstrap 95% CI. Non-inferiority holds when the lower limit lies right of $\Delta = -5\%$. Specificity did not differ between conditions (Wilcoxon, all n.s.).

Figure 2. Case-level sensitivity



Dashed line: specialist-inclusive double reading (S+N) 93.1%. Nodule-level: specialist AIS and AIC superior to S+N ($p=0.002$, $p=0.010$).

Figure 3. Reader-to-reader gap
Exploratory



Each line is one of the 9 readers. The specialist / non-specialist gap narrowed from 16.2 to 4.8 points; between-reader SD fell from 9.9 to 8.1.