

p = 0.560

No association between smoking status and lung cancer in an incidental nodule cohort

58.7%

Cancers would have been missed by BOTH USPSTF 2022 + TALENT

6.95×

higher malignancy odds: CXR ≥6mm vs incidental CT

0.943

Brock score AUROC excellent discrimination

INTRODUCTION

Chest X-ray (CXR) is widely used for diagnostic and screening indications in Singapore, and reported possible lung nodules account for a significant number of referrals to a lung nodule clinic. Other frequent referrals arise from incidental nodules detected on CT.

Screening criteria have been largely derived from Western, smoking-predominant populations and may perform poorly in Asian cohorts where never-smoker lung cancer is prevalent. The TALENT criteria are utilised in Asia, however, its efficacy has not been established in randomized controlled studies.

We evaluated malignancy rates across referral indications and established screening criteria, and assessed the Brock tool as a predictor of malignancy in patients with confirmed pulmonary nodules (≤30mm) on CT.

METHODS

Retrospective cohort study · Pulmonary nodule clinic, NUH Singapore · Sep 2023 – Jun 2025

- 1 USPSTF 2022 and TALENT criteria applied to all patients
- 2 Malignancy rates compared across referral pathways using unadjusted logistic regression
- 3 Group differences assessed by chi-squared and Fisher's exact tests
- 4 Brock score discrimination via area under the ROC curve (AUROC)

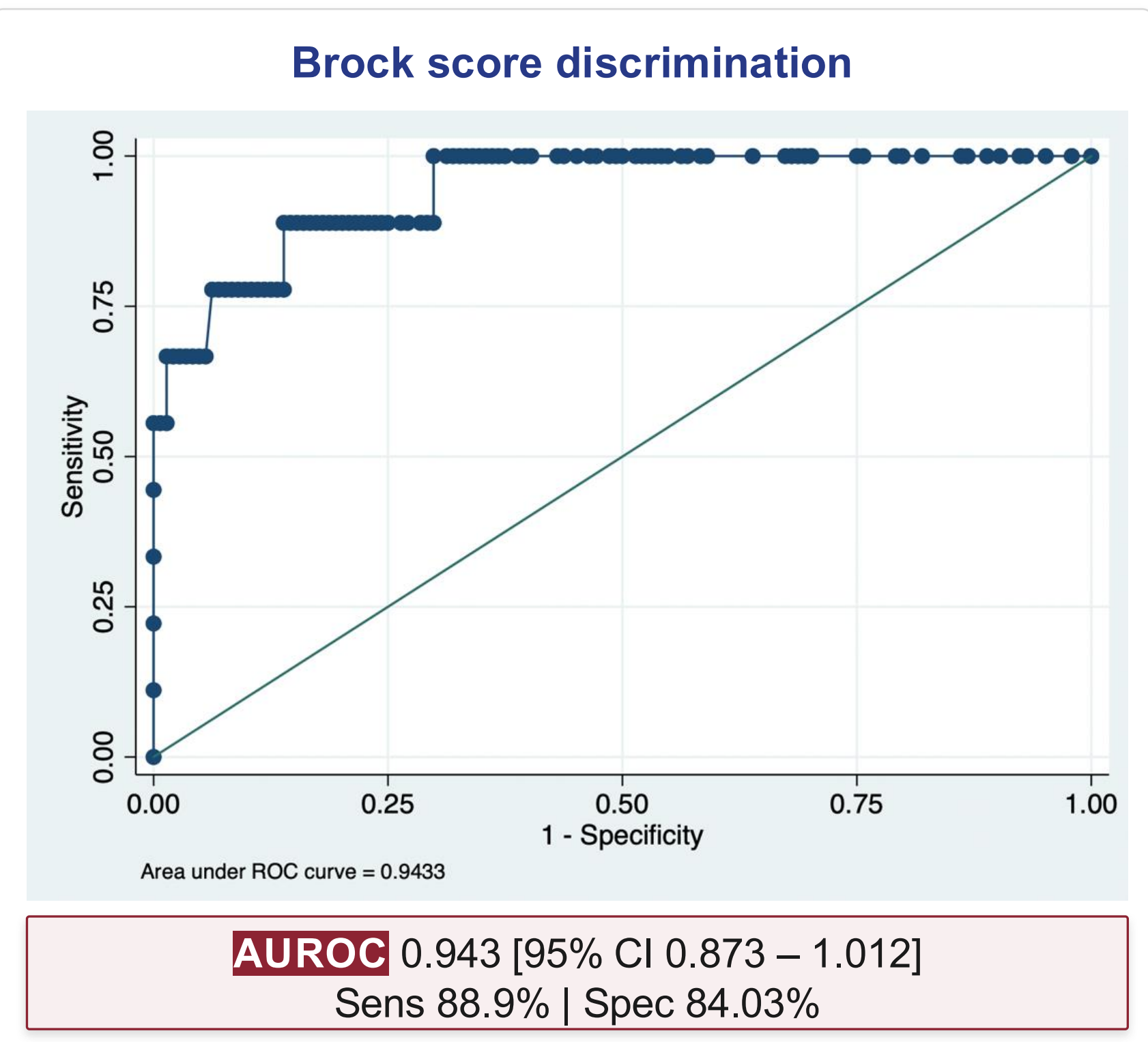
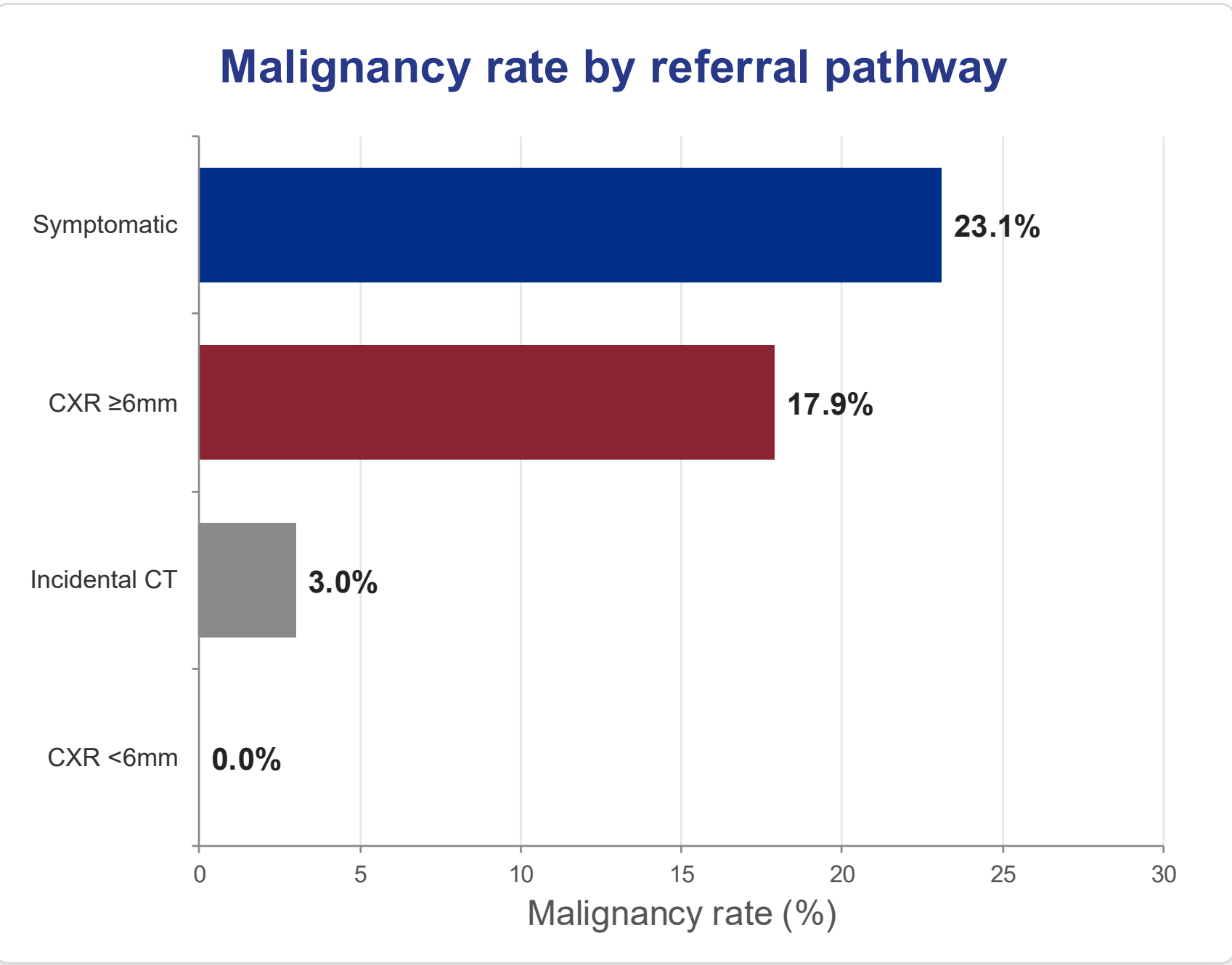
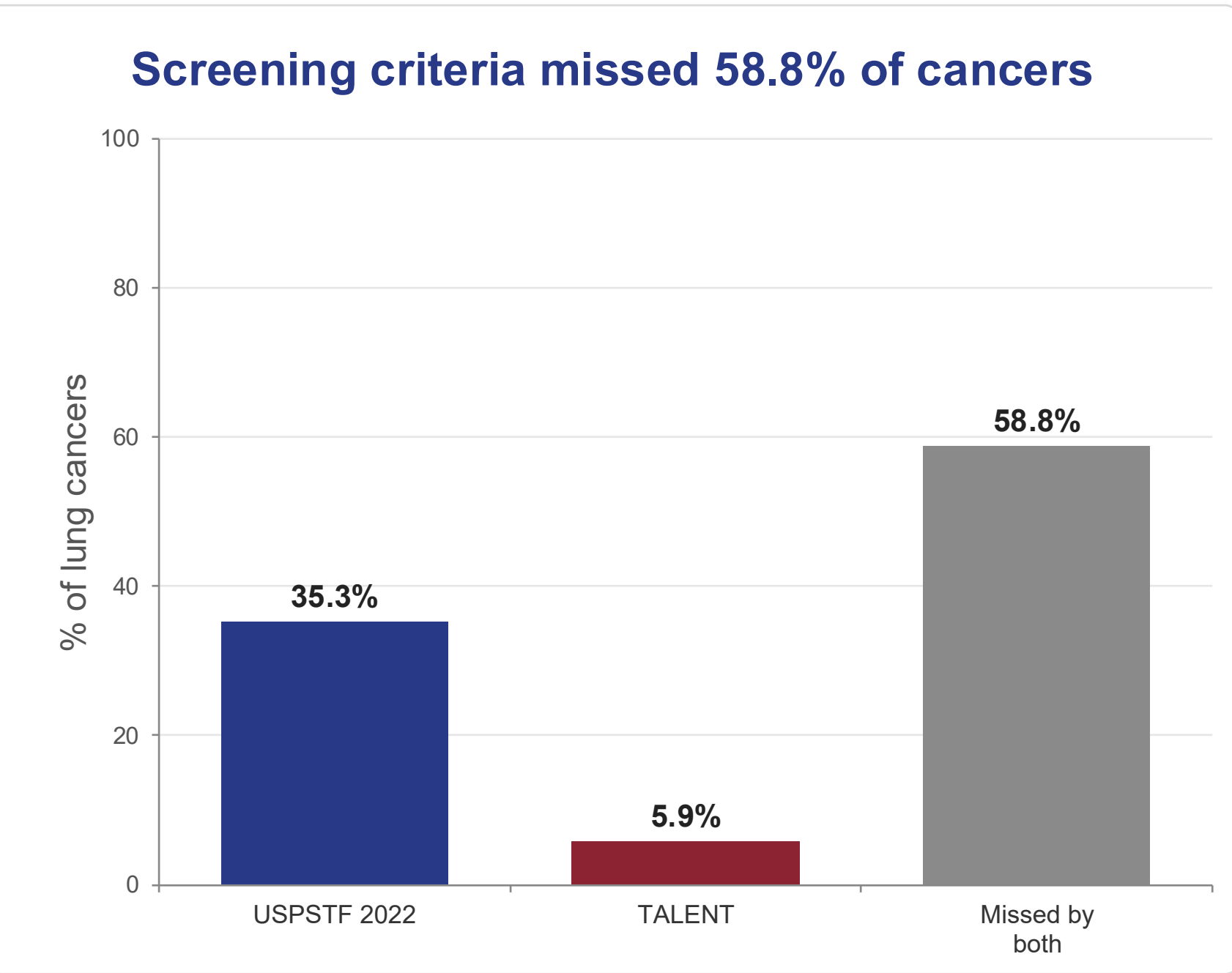
PRIMARY ENDPOINT

Confirmed clinical or histological diagnosis of lung cancer

246 patients **17** cancers (6.9%)

RESULTS

58.8% of cancer patients were never-smokers; smoking status did not differ between cancer and no cancer groups ($p=0.560$).



RECOMMENDATION

Lung nodule detection pathways should be redesigned to prioritise CXR ≥6mm referrals and adopt nodule-based tools (Brock) over smoking-based criteria. Larger studies with longer follow-up should be performed to develop streamlined, resource-efficient referral protocols. Further research is needed in early identification of lung cancer in the never-smoker at-risk cohort.

THREE KEY MESSAGES

- 1 **Existing Western and Asian screening criteria miss most cancers**
10 of 17 cancers (58.8%) were **missed by both criteria** (USPSTF 2022 and TALENT combined). Missed cancers were predominantly never-smoker, EGFR-mutated adenocarcinomas.
- 2 **Smoking does not predict malignancy in this Asian Cohort**
Smoking status did not differ between cancer and non-cancer patients ($p=0.560$); 58.8% of cancers arose in never-smokers.
- 3 **CXR ≥6mm nodules are high-yield; <6mm, not so**
17.9% malignancy rate (OR 6.95 vs CT); this pathway alone accounted for 41% of all lung cancers detected.

Criteria & pathway performance

Measure	Cancer	No Cancer	P-value
USPSTF 2022 met	35.3%	14.0%	0.021
TALENT met	5.9%	6.1%	0.959
Never-smoker	58.8%	68.1%	0.560
Pathway	Malignancy rate	OR [CI]	
Incidental CT	3.0% (4/132)	ref	0.003
Symptomatic	23.1% (3/13)	9.53 [1.87-48.6]	0.007**
CXR ≥6mm	17.9% (7/39)	6.95 [1.92-25.2]	0.003**
CXR <6mm	0%	Not calculable	—

KEY RESULT CXR ≥6mm nodules carried **OR 6.95** (95% CI 1.92–25.2; $p=0.003$) for malignancy vs incidental CT and produced **41% (7/17)** of all programme cancers.

CONCLUSION

Established smoking-based and never-smoker screening criteria failed to identify the majority of lung cancers in this incidental nodule Asian cohort.

The high burden of never-smoker, EGFR-mutated adenocarcinoma underscores the persistent challenge of identifying the at-risk never-smoking population.

CXR-detected nodules <6mm were **not** found to be malignant, and may not need additional follow-up.