Real-World Integration of Artificial Intelligence for Lung Cancer Prediction of Indeterminate Pulmonary Nodules

Objective: Low-dose CT has revolutionized lung cancer screening, but interpretation of indeterminate pulmonary nodules (IPNs) remains challenging. Artificial intelligence (AI) software capable of predicting malignancy risk offers the potential to improve diagnostic precision leading to earlier treatment while reducing unnecessary procedures. We evaluated the clinical application of an AI lung cancer predictive (LCP) scoring system of IPNs.
Methods: Patients with IPNs <3 cm and no prior malignancy were prospectively entered into proprietary AI software, which generated an LCP score from 1 (0.2% risk of cancer) to 10 (93% risk of cancer). Patients were followed through their clinical course, and outcomes were correlated with traditional risk factors, Lung-RADS, and final pathology. Correlation analyses were performed for LCP score, malignancy, and clinical intervention.
Results: From 2023–2025, 187 patients were enrolled in the AI prediction program; 136 patients (72.7%) with 169 nodules underwent LCP scoring, Malignancy was confirmed in 39 patients (28.6%). Cohort demographics mirrored national lung cancer screening populations. Mean nodule size was 14.2 mm (malignant nodules-16.5 mm vs. benign-13.2 mm, $p = 0.008$). Approximately 90% of malignant nodules had an LCP score ?8. Using this threshold, diagnostic performance had a sensitivity 81%, specificity 93%, positive predictive value 84%, negative predictive value 93%, and accuracy 90%. LCP score correlated strongly with malignancy ($R = 0.69$, $p < 0.001$) and clinical decision-making ($R = 0.66$, $p < 0.001$), but not with smoking status ($R = 0.09$), nodule size ($R = 0.34$), or number of nodules ($R = 0.50$) Lung-RADS demonstrated moderate correlation with LCP score ($R = 0.34$, $p < 0.01$). Among patients who underwent preoperative biopsy, only 31.4% yielded a diagnosis of malignancy, whereas 90% of malignant cases were correctly predicted by a LCP score ?8, including all of those with false-negative biopsies. Management decisions aligned closely with LCP score stratification, with most patients above the diagnostic threshold (LCP score > 8) proceeding directly to surgical resection.
Conclusions: AI-driven LCP scoring accurately predicts lung cancer and influences clinical decision-making in real-world practice by expediting the diagnosis of IPNs. High accuracy of AI LCP scoring (> 8) decreases unnecessary imaging and diagnostic procedures prior to definitive surgical treatment of lung cancer.

Daniel Miller (1), Mikenzie Sturdevant (1), Richard Aldan (1), Neel Kulkarni (1), Preston Sparks (1), John Kuckelman (1), (1) Medical College of Georgia at Augusta University, Augusta, GA

Additional Resources

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