

Efficacy of AI-Assisted Colposcopy in Minimizing Overtreatment During Primary HPV Screening: A Systematic Review and Meta-Analysis

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Introduction

The high sensitivity of primary HPV screening may increase colposcopy referrals and unnecessary biopsies. We evaluated AI-integrated colposcopy for CIN2+ detection and its potential to minimize overtreatment.

Methods

Following PRISMA guidelines and our registered PROSPERO protocol, PubMed, Embase, and Cochrane were searched through June 2026. Eight studies were included; three provided eligible patient-level comparisons with reconstructable 2×2 data. Sensitivity and specificity were pooled separately using random-intercept logistic regression.

Results

The primary synthesis included 1,537 women and 291 CIN2+ cases. Pooled sensitivity was 97.6% (95% CI: 92.9–99.2%) with AI integration versus 84.6% (95% CI: 79.6–88.5%) with conventional assessment. Specificity was 32.2% (95% CI: 18.0–50.7%) versus 55.6% (95% CI: 50.6–60.5%), respectively. Specificity heterogeneity was substantial (I^2 : 98.2% versus 74.5%). Integration strategies differed across studies. Excluding Chang 2025 also preserved the direction of the sensitivity finding, while the specificity gap narrowed substantially. Separate pooled estimates do not establish statistical superiority.

Conclusions

AI-integrated colposcopy may improve sensitivity for CIN2+ detection, while specificity appears workflow-dependent. Current evidence does not establish reduced biopsies or overtreatment. The small, heterogeneous evidence base warrants caution. Prospective studies should assess patient-important outcomes.