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Effect of AI-assisted Diagnosis on Adenomas of Different Sizes: A Meta-Analysis with Evidence from RCTs and Trial Sequential Analysis

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Shi, YY; Liu, JS; Wang, AY; Wang, DC; Cheng, Y.

Corresponding author:
Dengchao Wang

wangdengchaopwk@163.com

Author Affiliation:
Department of Gastrointestinal Surgery, The First Affiliated Hospital of Chongqing Medical University.

ADMINISTRATIVE INFORMATION

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Conflicts of interest - None declared.

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Amendments - This protocol was registered with the International Platform of Registered Systematic Review and Meta-Analysis Protocols (INPLASY) on 12 April 2025 and was last updated on 12 April 2025.

INTRODUCTION

Review question / Objective To comprehensively assess how artificial intelligence (AI)-enhanced colonoscopy performs in identifying colorectal adenomas of different sizes, with an emphasis on adenoma detection rate (ADR) and adenoma miss rate (AMR), supported by data from randomized controlled trials and trial sequential analysis.

Condition being studied Colorectal adenomas of varying sizes (≤5 mm, 6–9 mm, ≥10 mm) are considered precursors to colorectal cancer and represent critical targets for early detection and prevention strategies.

METHODS

Participant or population Individuals aged 18 and above who received colonoscopy for colorectal cancer screening, diagnostic assessment, or post-treatment surveillance.

Intervention Colonoscopy enhanced by artificial intelligence through real-time computer-aided detection (CADe) systems employing deep learning algorithms.

Comparator Standard colonoscopy procedures without AI integration, generally performed with high-definition white-light imaging technology.

Study designs to be included RCTs.

Eligibility criteria Inclusion: Randomized controlled trials (RCTs) involving adult subjects that assessed AI-assisted colonoscopy, with results for adenoma detection rate (ADR) and/or adenoma miss rate (AMR) categorized by lesion size.
Exclusion: Non-randomized studies, trials without size-specific outcome data, literature reviews, conference abstracts, unpublished reports, or studies missing key outcome indicators.

Information sources PubMed, Embase, Cochrane Library, Web of Science, ClinicalTrials.gov, VIP, Wanfang, CNKI, and CBM.

Main outcome(s) Detection and miss rates (ADR and AMR) for adenomas measuring ≤5 mm
Detection and miss rates for adenomas sized 6–9 mm
Detection and miss rates for adenomas ≥10 mm.

Quality assessment / Risk of bias analysis The methodological quality of included studies was assessed using the Cochrane Risk of Bias tool, while the GRADE approach was applied to evaluate the strength of evidence for each outcome.

Strategy of data synthesis Statistical analyses were performed using RevMan 5.4 and Stata 17.0, with fixed- or random-effects models selected according to the level of heterogeneity. Trial sequential analysis (TSA) was utilized to evaluate the stability and sufficiency of the evidence.

Subgroup analysis Geographic variation in AI performance was examined by conducting subgroup analyses comparing studies conducted in China with those from other countries.

Sensitivity analysis Leave-one-out sensitivity analyses were conducted to test the stability of pooled estimates.

Country(ies) involved China.

Keywords Adenoma; Colonoscopy; Artificial Intelligence; Detection rate; Meta-analysis; Trial sequential analysis.

Contributions of each author
Author 1 - Youyun Shi.
Author 2 - Jinshan Liu.
Author 3 - Anyin Wang.
Author 4 - Dengchao Wang.
Author 5 - Yong Cheng.