

Questionnaire-Based Tools for Colorectal Cancer Screening and Risk Assessment: A Scoping Review

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INTRODUCTION

Colorectal cancer (CRC) is one of the most common malignancies worldwide. The implementation of screening programs has been shown to significantly reduce mortality. Individual risk stratification using structured tools may improve the efficiency of screening programs by directing resources to individuals at higher risk while reducing unnecessary procedures for those at lower risk. However, the available literature reveals substantial heterogeneity among existing tools, with limited clinical validation and poor integration into screening programs.

OBJECTIVES

To systematically map questionnaire-based tools developed for CRC risk assessment and stratification in average-risk populations, evaluating their methodological characteristics, applicability, and validation status.

METHODS

A scoping review was conducted following the Arksey and O'Malley framework and the Joanna Briggs Institute methodology, and reported according to the PRISMA-ScR guidelines. Searches were performed in Medline/PubMed, Embase, Scopus, and Web of Science up to July 24, 2025. Study selection was conducted using the Rayyan platform by three reviewers working in parallel. Studies describing, developing, or validating questionnaire-based tools (paper-based, digital, app-based, or risk algorithms) for CRC risk assessment in average-risk adults were included. Data extraction was

performed using a standardized form. ChatGPT was used to support preliminary data extraction, which was subsequently verified by human reviewers.

RESULTS

A total of 4,554 records were identified. After duplicate removal ($n=2,467$), 2,087 records underwent screening, and 106 full-text articles were assessed for eligibility. Nineteen studies met the inclusion criteria. Studies were published between 2006 and 2025 and originated from nine countries, primarily China, the Netherlands, Norway, and the United States. Ten studies (52.6%) developed study-specific tools, whereas nine (47.4%) used, adapted, or modified previously published instruments, most commonly the Asia-Pacific Colorectal Screening (APCS) score and its variants. Questionnaires contained between 4 and 29 items (median: 6), covering demographic, clinical, behavioral, and lifestyle-related risk factors. Measures of discrimination were reported in 13 studies, with AUC/C-index values ranging from 0.60 to 0.89 (median: 0.67). Overall, 40 validation analyses were identified across multiple outcomes, including incident CRC, advanced neoplasia, and precancerous lesions. Predictive performance varied substantially across target populations, assessed outcomes, and questionnaire compositions. External validation was reported for only a minority of tools.

CONCLUSIONS

This scoping review provides a comprehensive mapping of questionnaire-based tools for colorectal cancer risk assessment in average-risk populations. Although several instruments demonstrated acceptable discriminatory performance,

substantial heterogeneity was observed in questionnaire content, target outcomes, modeling approaches, and validation strategies. The limited availability of external validation and the limited integration of these tools into organized screening programs represent important barriers to implementation. Future research should prioritize standardization, external validation, and evaluation of these tools in real-world screening settings to support risk-based colorectal cancer screening strategies.