The Utilization of Artificial Intelligence (AI) in Colonoscopy Screening in Detecting Colorectal Cancer

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Dear Editor,

Artificial intelligence (AI) is a specialized field of computer science that focuses on creating intelligent machines to perform tasks typically requiring human-like intelligence. AI has recently been increasingly applied in medicine to enhance disease diagnosis, treatment planning, and outcome prediction accuracy and efficiency.

Colorectal cancer (CRC) is a prevalent malignancy of the colon or rectum and is the second leading cause of cancer mortality globally.

AI tools analyze colonoscopy images and videos to enhance adenoma detection and support decision-making, potentially improving colon cancer screening accuracy and reducing unnecessary biopsies.

AI is used in gastroenterology to improve polyp detection and CRC prediction through enhanced image analysis. In trials, AI-driven computer-assisted diagnosis systems have shown superior adenoma detection compared to conventional colonoscopy. However, clinical adoption of AI faces challenges, including the need for large, annotated datasets and consistent image interpretation, requiring rigorous validation through controlled studies for widespread use (Sharma et al., 2023).

Lou et al.'s (2023) systematic analysis found that AI-aided colonoscopy significantly enhanced colorectal neoplasia detection. It reduced adenoma and polyp miss rates by 50.5% and 52.5%, increased detection rates by 24.2% and 23.8%, and increased per-colonoscopy rates by 39% and 38.8%, respectively. AI-aided colonoscopy identified more patients with advanced adenomas and increased detection of diminutive and small adenomas, especially in the proximal colon. Endoscopists with lower detection rates and shorter times and younger patients with fair preparation benefited the most. Extensive research has shown that AI can effectively aid CRC patients by improving screening efficiency and the 5-year post-treatment survival rate (Mitsala et al., 2021).

A study developed and validated a Convolutional Neural Network (CNN) for automated detection of protruding lesions in colon capsule endoscopy (CCE) images, demonstrating high sensitivity, specificity, and accuracy. This AI technology, processing images at 66 frames per second, could significantly reduce CCE exam review time, improving diagnostic efficiency and accuracy in colorectal neoplasia screening. Despite the limitations of a retrospective design and small dataset, the findings highlight AI's potential to enhance CCE's diagnostic yield for detecting colorectal abnormalities.(Saraiva et al., 2021).

Using CNNs for polyp detection in endoscopic procedures faces challenges, including false positive-induced removal of non-neoplastic lesions and potential increases in procedure time as less experienced endoscopists assess these false positives. While the study demonstrated the effectiveness of CADe (Computer-Aided Detection) in an expert setting, further research is needed to evaluate its applicability and efficiency for endoscopists with varying experience levels (Repici et al., 2020).

AI has significantly advanced gastroenterology, particularly in detecting and characterizing intestinal polyps and CRC. AI algorithms, including machine learning and deep learning, enhance adenoma detection rates, reduce false positives, improve endoscopic image quality, automate artifact correction, and facilitate accurate clinical decision-making. These systems have demonstrated effectiveness in real-time polyp detection and classification of colorectal lesions, potentially minimizing unnecessary treatments. More-

over, AI contributes to CRC management by predicting disease progression, assisting in treatment planning, and promoting personalized medicine approaches (Sharma et al., 2023; Mitsala et al., 2021).

However, the widespread clinical integration of AI faces obstacles, including high false-positive rates and the need for extensive clinical validation. Challenges also encompass ethical and privacy concerns, the "black box" nature of AI decisions, and the management of large data sets (Mitsala et al., 2021). Despite these hurdles, the potential of AI to enhance healthcare, especially in CRC management, remains significant, contingent upon interdisciplinary collaboration for its safe and effective application. In the future, AI technology may assist endoscopists in determining treatment plans and identifying patients who require further surgery after early-stage colorectal carcinomas are removed through endoscopy.

Funding

Conflicts of Interest

The authors declare no conflict of interest.

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