

Impact of artificial intelligence on novice endoscopists' colonoscopy training

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Dear Editor,

Artificial intelligence (AI) has been increasingly utilised by endoscopists worldwide in recent years to enhance adenoma detection rates (ADR).¹ Currently, endoscopy presents a steep learning curve, requiring novice endoscopists to acquire numerous cognitive and motor skills during hurried procedures.² Studies have examined the knowledge, beliefs, and perceptions of experienced endoscopists regarding the use of AI in endoscopy but have not examined long-term skill acquisition or potential deskilling among novices.³ In this letter, the authors aim to survey novice endoscopists' attitudes towards knowledge and utilisation of AI in their training.

An online survey was conducted in October 2025 to examine perceptions of AI use in colonoscopy training. According to the Joint Advisory Group on Gastrointestinal Endoscopy in the UK, the number of

colonoscopies required to achieve a caecal intubation rate of $\geq 90\%$ was 200.⁴ Hence, the eligibility criteria for this study included general surgery and gastroenterology residents from 3 tertiary healthcare institutions in Singapore who had performed fewer than 200 colonoscopies. The survey evaluated the demographics, educational background, and professional characteristics of the residents. The questions regarding colonoscopy skills and perspectives on AI were adapted from the American Society for Gastrointestinal Endoscopy training guide and Tham et al.⁵ The main software utilised by the residents was computer-aided detection (CADe) and computer-aided diagnosis, specifically GI Genius (Medtronic) and CAD-EYE (Fujifilm).³

The questionnaire included 4 thematic domains: (1) current perspectives on endoscopy training, (2) knowledge and perception of AI, (3) current use of

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AI in endoscopy training, (4) general perceptions of the use of AI in clinical work. Question formats included 5-point Likert-scale items (e.g. from “Strongly agree” to “Strongly disagree” and from “Always” to “Never”), yes-or-no questions, and open-ended questions. Quantitative data analysis employed descriptive statistics. Qualitative analysis was conducted by the first and senior authors, following extensive discussion, using thematic analysis of the survey responses, guided by Braun and Clarke’s 6-phase framework.⁶ This included familiarisation with the data, generating initial codes, searching for themes, reviewing themes, defining and naming themes, and writing the report to categorise responses to open-ended questions. A semantic and latent interpretation of the survey’s verbatim results was also employed in the qualitative analysis.

The majority of the 50 endoscopists surveyed found it challenging to acquire endoscopy-related cognitive and motor skills. Participants believed that they were familiar with AI and large language models (LLMs). However, only a small percentage genuinely understood how different algorithms functioned. A majority (64.0%) reported limited exposure to AI but expressed interest in understanding it (86.0%). When asked about their perspectives on the current utilisation of AI, 88.0% expressed interest in learning how AI worked. Furthermore, 52.0% agreed that AI has improved colonoscopy quality, which is lower than the 62.5–97% of experienced endoscopists who believed that AI would positively impact endoscopic performance. Some agree that AI has improved endoscopy quality (48.0%) and will aid in developing skills (56.0%). Concerns remain regarding accuracy (16.0%) and potential deskilling (20.0%).

As many skills must be developed simultaneously, it is more challenging to acquire them all at once. Therefore, by easing the burden of developing cognitive skills such as polyp recognition, AI may help novice endoscopists refine their motor skills while also increasing their ADR.¹²

Although some residents self-reported having some knowledge, most of their answers were inaccurate, especially regarding neural networks, as shown in Table 1. This indicates insufficient understanding of the algorithms currently used in medical AI, machine learning, and LLMs, especially neural networks and deep learning.¹³ However, some residents still understood how AI and LLMs work. This may be due to the rapid rise in the popularity of LLMs among medical practitioners worldwide (see explanations for each of the different AI models in Supplementary Table S1).¹¹ The rate of digital literacy is lower than that observed among senior endoscopists (50.0%). Many also raised the concern that they rarely or never used AI in their practice. Furthermore, for those who learned to utilise CADe, this was only at a superficial level during actual hands-on colonoscopy procedures, while they were still expected to learn other motor and cognitive skills simultaneously. Therefore, they might not know how to optimise CADe functionality. Many also reported not having formal lessons on the use of AI. This highlights the need for greater efforts at medical schools and during residency training to upskill novice endoscopists in AI.

In total, 44.0% believe that AI can improve colonoscopy training by enhancing the ability to recognise polyps. As multiple studies have shown, using CADe can improve ADRs by detecting polyps and highlighting them in real time. It can also aid in recognising caecal landmarks and give feedback on adequate mucosal exposure. By taking on the cognitive burden of recognising ADRs at the outset, novices can focus on developing the multiple motor skills required to manoeuvre the scope safely. Others also noted that AI makes it easier to provide real-time feedback on missed lesions, thereby reinforcing visual pattern recognition and reducing the reinforcement of false negatives.¹⁴ Furthermore, CADe systems can help generate metrics for time to lesion recognition, missed lesions and mucosal inspection completeness, allowing for objective longitudinal tracking of perceptual

Table 1. Understanding of different artificial intelligence algorithms.

	No. of residents who have the correct explanation of each algorithm, (%)	No. of residents with an inaccurate explanation of how each algorithm works, (%)	No. of residents who mentioned that they do not understand the algorithm, (%)
Artificial intelligence	8 (16.0)	12 (24.0)	30 (60.0)
Machine learning	4 (8.0)	9 (18.0)	37 (74.0)
Neural networks	0 (0.0)	2 (4.0)	48 (96.0)
Deep learning	0 (0.0)	5 (10.0)	45 (90)
Large language models	3 (6.0)	6 (12.0)	41 (82.0)

improvement for the trainees. As seniors may have to guide multiple trainees simultaneously, this allows them to quickly track, recognise, and focus on each novice's weak points to address.

Despite a positive overall perception, 10.0% cited AI as likely to result in insufficient skill development in detecting precancerous polyps. A study reported that faster polyp detection increased CADe misinterpretation of normal mucosa by reducing the eye travel distance.¹⁵ Another showed that experienced endoscopists who used AI continuously led to a 22.4–28.4% reduction in endoscopist capability, suggesting a detrimental effect on endoscopist capability.¹⁶ Another common concern was that CADe was inaccurate in diagnosing lesions. As CADe is a neural network, it has been trained on many adenoma images; hence, it can detect adenomas more accurately than humans. Although CADe has improved detection rates, it has not been trained on sessile serrated lesions, which carry a risk of malignant transformation. This aligns with residents' suggestions that AI should be trained to detect lesions beyond adenomas. AI has also been linked to sensory and cognitive overload, as residents may be overwhelmed by excessive alerts and false positives. Other concerns raised by experienced endoscopists include prolonged withdrawal times and the long-term cost-effectiveness of AI systems.

The relatively small sample size of 50 makes it challenging to conduct statistically significant analyses across groups defined by various metrics that inherently affect their views on AI. As such, the authors recommend conducting such a survey on a larger scale, involving more countries in the region in subsequent iterations.

In conclusion, novice endoscopists have limited exposure to AI during colonoscopy training but are open to learning and utilising it further. They remain optimistic about AI's role as an adjunct to enhance endoscopic training and patient outcomes. However, reservations about deskilling and programme accuracy present barriers to fully integrating AI into colonoscopy training.

Supplementary material

Table S1. Definitions of different artificial intelligence algorithms.

Ethics statement

This study was approved by the SingHealth Centralised Institutional Review Board (2022/2695).

Declaration

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