EDITORIAL

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Risk-stratified colorectal cancer screening for optimal use of colonoscopy resources

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Colorectal cancer (CRC) is the second most common malignancy and the third most common cause of cancer-related death in Korea, according to the national cancer statistics in 2016 [1]. The National CRC screening program of Korea was implemented in 2004, and it includes an annual fecal immunochemical test (FIT) for adults 50 years of age or older and subsequent colonoscopy for those positive for fecal occult blood [2]. Given that FIT cannot provide a confirmative diagnosis of CRC but can identify candidates for screening colonoscopy, the national CRC screening program is a risk-stratified screening model based on age and FIT results. In addition to Korea, other countries with CRC screening programs adopt FIT-based screening [3]. Biennial FIT-based screening showed a 10% reduction in CRC incidence and a 22% to 27% reduction in CRC-related mortality in Italy [4,5]. A similar biennial FIT screening program in Taiwan achieved a 62% reduction in CRC-related mortality in an observational cohort study [6].

Colonoscopy is not only a confirmative test for the FIT-positive population but also a primary screening tool for CRC. According to the National Polyp Prevention study, colonoscopic polypectomy reduced CRC-related mortality by 53% [7]. A study of a large prospective cohort comprising nurses and other health-care professionals reported that screening colonoscopy was associated with a 68% reduction in CRC-specific mortality, a 74% reduction in the incidence of distal CRC, and a 27% reduction in the incidence of proximal colon cancer [8]. According to a meta-analysis of observational studies regarding screening colonoscopy, the reduction of CRC incidence and CRC-related mortality is strongly effective for distal CRC and moderately effective for proximal colon cancer [9].

Although colonoscopy plays a key role in CRC prevention and mortality reduction, national and community-based resources for colonoscopy are limited. Moreover, CRC screening guidelines from the American Cancer Society, US Preventive Services Task Force, and American College of Gastroenterology brought forward the starting age for CRC screening from 50 to 45 years [10-12]. If the same strategy is applied in clinical practice in Korea, the burden of screening colonoscopy will increase in the near future. Therefore, a risk-stratified or individualized approach for CRC prevention would promote efficient use of colonoscopy resources.

Yang et al. [13] developed a risk score

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model using logistic regression (LR) for multiple clinical and laboratory indicators to predict advanced colorectal neoplasia (ACRN), a surrogate marker of CRC in CRC prevention and surveillance studies. Although their risk scoring model showed the association of risk categorization with ACRN prevalence, it is complex to use in clinical practice and shows limited sensitivity [13]. Subsequently, the same group investigated whether a deep-learning model is a better predictor of the risk of ACRN in asymptomatic adults than their previous LR risk score model and reported the results in this issue of the *Korean Journal of Internal Medicine* [14]. This study used the same dataset as the previous LR model [13] and the same 26 variables to develop a deep neural network (DNN). These variables include a set of clinical and environmental risk factors of CRC [15] and a group of laboratory variables (serum glucose, glycated hemoglobin, blood lipid profile, serum insulin, high-sensitivity C-reactive protein, complete blood cell count, serum ferritin, and serum carcinoembryonic antigen). Their DNN model showed significantly improved performance compared with the LR model based on the area under the curve (AUC). However, the difference in AUC between the DNN and LR models is small (AUC of DNN = 0.760 vs. AUC of LR model = 0.724), and an AUC of 0.7 to 0.8 is generally considered 'fair' diagnostic performance. Therefore, the current DNN model may not be acceptable for deciding whether to perform screening colonoscopy for a particular individual.

Nonetheless, it is meaningful that the slight improvement in diagnostic performance for ACRN using the DNN model reduces the estimated colonoscopy workload compared with the LR model. Interestingly, previous studies reported that the performance of environmental factor-based CRC prediction models was modestly improved by adding biomarkers such as single-nucleotide polymorphisms [16,17]. Therefore, combining artificial intelligence-based models with genetic biomarkers for CRC is a subject for future research on individualized CRC screening [18,19]. To cope with the anticipated increase in the colonoscopy burden, further studies on risk-stratified approaches to CRC screening should be encouraged.

Conflict of interest

No potential conflict of interest relevant to this article was reported.

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