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## Can Patient Education with a Smartphone Application Improve the Quality of Bowel Preparation for Colonoscopy?

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See "The Impact of Patient Education with a Smartphone Application on the Quality of Bowel Preparation for Screening Colonoscopy" by JeongHyeon Cho, SeungHee Lee, Jung A Shin, et al., 479-485.

Colonoscopy is an effective method for prevention of colorectal cancer and colorectal cancer-related mortality.<sup>1,2</sup> For successful colonoscopy, adequate bowel preparation is essential. Inadequate bowel preparation may lower the cecal intubation rate, and increase the procedural time and number of missed lesions, which may require earlier repeated colonoscopy, ultimately increasing overall health-care expenditures.<sup>3</sup> In spite of the importance given to bowel preparation, 18.0%–30.5% of patients still show suboptimal bowel preparation.<sup>4-6</sup>

The quality of bowel preparation can be influenced by many factors, including diet restriction, time and amount of taking purgatives, and patient factors, such as age, comorbidities, physical activity, and patient compliance.<sup>7</sup> Among the factors associated with the quality of bowel preparation, patient compliance to purgative agent and dietary instructions has a potential to be improved with a careful and comprehensive effort. A previous study showed that noncompliance to bowel preparation instructions is a risk factor for inadequate preparation, with a considerable risk (odds ratio [OR] of 4.76 for inadequate preparation).<sup>8</sup> Consensus guideline by the

United States Multi-Society Task Force on bowel cleansing for colonoscopy stated that physicians should provide a patient educational program to achieve better bowel preparation.<sup>9</sup> Thus, many educational tools have been suggested to improve patient compliance to instructions, including telephone calls, cartoon visual aids, and videos.<sup>10-12</sup> Recently, a meta-analysis confirmed the effectiveness of enhanced education in improving the quality of bowel preparation (OR, 2.35; 95% confidence interval [CI], 1.65–3.35;  $p < 0.001$ ) and the patient's willingness to repeat the preparation (OR, 1.91; 95% CI, 1.20–3.04;  $p = 0.006$ ).<sup>13</sup> However, the previously developed educational methods for bowel preparation are not universally utilized in reality. More-comprehensive interventions that are generally feasible, user friendly, and intensive are required.

In this issue of *Clinical Endoscopy*, Cho et al. studied the efficacy of educational intervention with a smartphone application (app) to improve bowel preparation quality.<sup>14</sup> The educational app developed by the authors consisted of 4 sections: explanations of the colonoscopy procedure, dietary instructions, and instructions to prepare and drink the purgative agent. This study was conducted at a single center in Korea and included 142 patients indicated to undergo colonoscopy. Seventy-one patients were provided enhanced education via a smartphone app, and the rest were educated using traditional verbal and written instructions. Compared with the control group, the smartphone app group showed higher bowel preparation quality, as assessed with the Boston Bowel Preparation Scale ( $7.70 \pm 1.1$  vs.  $7.24 \pm 0.8$ ,  $p = 0.007$ ). The app group showed higher satisfaction with the education delivery meth-

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od for colonoscopy preparation than the control group did. Working time, adenoma detection rate, and polyp detection rate did not significantly differ between the two groups.

This is an interesting and noteworthy study in the modern age, when the use of smartphones and apps is increasing rapidly. Smartphone usage in the South Korean population has been estimated to be approximately 86.4%.<sup>15</sup> Coinciding with the popularity of smartphones, the use of smartphone apps in the medical field has been increasing recently.<sup>16,17</sup> However, only few studies have evaluated the efficacy of smartphone apps in the field of patient education for bowel preparation.<sup>6,18,19</sup>

The strengths of using an app for patient education include various educational contents, such as written instructions, visual aids, and instructional videos, and an alarm system.<sup>19</sup> In addition, it is easily accessible and repeatable when patients want to review the contents. However, this intervention can be limited by the fact that it may be difficult to apply to elderly patients because most of them are not familiar with the use of a smartphone. Another problem is that costs are incurred when using mobile data during education via the smartphone app.

In this study, the efficacy of patient education with a smartphone app was evaluated in patients aged  $\leq 50$  years. Whether it has the same effectiveness in the elderly remains unclear. The prevalence of adenoma increases sharply with age, thus, screening with colonoscopy usually starts at the age of 50 years in many countries.<sup>20</sup> However, as the prevalence of advanced colorectal neoplasm is reported to be approximately 3.5% in subjects aged  $< 50$  years,<sup>21</sup> attention to the necessity of screening colonoscopy in young adults is increasing. Thus, intervention is needed to increase the bowel preparation quality even in young patients.

In this study, unlike in other studies, the alarm alerting approaching colonoscopy was set 3 days before the procedure. After the colonoscopy appointment date was entered in the app, the alarm function started. For every meal, the app informed patients on what food items to eat.<sup>14</sup> The alarm function can be the best advantage of education with a smartphone app. If the patient uses the alarm function well, the effectiveness of real-time education can be expected through this method.

In summary, the smartphone app could be a promising method of enhanced education for bowel preparation focused on the young population. However, as this method could be applied only to subjects who can easily access the Internet, the general utilization of a smartphone app as an enhanced education method for bowel preparation needs to be confirmed in a further study.

## Conflicts of Interest

The authors have no financial conflicts of interest.

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