Cost-effectiveness analysis of colorectal cancer screening using new screening tests in Japan

by

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Abstract

Background: A population-based colorectal cancer (CRC) screening program using fecal immunochemical test (FIT) was implemented in Japan. However, the incidence of CRC has been increasing over the years and it remains a leading cause of death in Japan. While the Japanese government recommends a participation rate of 60% for the program, the uptake rate remains about 40%. New screening tests, such as multitarget stool DNA (mtSDNA) and blood-DNA may improve screening acceptance. The objective of this study was to evaluate the cost-effectiveness of population-based CRC screening programs in Japan using the mtSDNA and the blood-DNA as the alternative screening tests for FIT.

Methods: A microsimulation model that simulates the natural history of CRC development was used to evaluate the cost-effectiveness of screening strategies with FIT every year, mtSDNA every three years, and blood-DNA every two years. The screening strategies were compared in three scenarios with different uptake rates of screening tests: (i) perfect uptake rates; (ii) target uptake rates of 60%; and (iii) realistic uptake rates. Outcomes included costs, quality-adjusted life-years (QALYs), incremental cost-effectiveness ratios (ICER), CRC incidence and mortality, and number of colonoscopies performed. The cost-effectiveness analysis was performed from the Japanese healthcare payer's perspective, and a willingness-to-pay (WTP) threshold was set as 5,000,000 JPY per QALY gained.

Results: All three strategies decreased CRC incidence and mortality compared with no screening. In the case of perfect uptake rates, mtSDNA and blood-DNA gained more QALYs but required more cost compared with FIT. The ICER for mtSDNA and blood-DNA against FIT was over the WTP threshold, and they were 108,470,321 JPY and 42,175,298 JPY,

respectively. In other scenarios with different uptake rates, mtSDNA and blood-DNA decreased CRC incidence and mortality compared with FIT. However, the cost-effectiveness analyses showed that they were either simply dominated or with the ICERs over the WTP threshold compared with FIT.

Conclusion: Our results suggest that CRC screening using FIT is the most cost-effective among alternative screening tests. These results support that an improvement in participation in the current population-based CRC screening program would be the main strategy to reduce CRC incidence and mortality in Japan.

Keywords: colorectal cancer, cost-effectiveness, screening, FIT, stool-DNA, mtSDNA, Cologuard, blood-DNA, mSEPT9