Executive Summary

Analysis of factors associated with adherence to additional examination in National Colorectal Cancer Screening and its outcomes research

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▢ Background

Since 2004, the National Colorectal Cancer Screening Program has been annually conducting fecal occult blood test (FOBT) for men and women aged 50 and older. Person with FOBT-positive have recommend double contrast barium enema (DCBE) or colonoscopy as additional screening.

Therefore, the participation rate of FOBT as the first screening test and additional tests as the second screening test are considered to be an important index. In particular, it was necessary to identify the current problems such as non-compliance due to loss of follow-up, delayed further testing, delayed diagnosis due to a lack of understanding of test results.

▢ Objective

The purpose of this study was to investigate the current state of follow-up examination of national colorectal cancer screening, factors affecting participation in screening, and analyze the performance according to screening compliance. This study may contribute to provide base data for developing the strategy to improve national colorectal cancer screening.

▢ Methods

We reviewed previous literature and guidelines for colorectal cancer screening. We also defined the main variables of the questionnaire items and the secondary data sources through consultation with clinical specialists and institutions, such as the National Cancer Center (NCC) and National Health Insurance Service (NHIS), which administer cancer-screening programs. In this study, we linked and analyzed secondary data sources, such as central cancer registry data, health insurance claim data (NHIS-2017-1-166), and the cause of death data from Statistics Korea. Our study was approved by the National Evidence-based Healthcare Collaborating Agency Institutional Review Board (NECAIRB 17-005).

1) Status and Factor Analysis of Additional Screening for National Colorectal Cancer Screening

From 2009 to 2013, we used cancer screening data to estimate the basic characteristics of FOBT-positive recipients, and we analyzed the number of examinees according to sex, age, insurance category, region, and so on. In addition, we linked the screening data with the claims data to identify the participation of the additional screening, and we defined the patients who received additional screening by using the results of DCBE and colonoscopy and the procedure codes of the claims data. Those who received additional screening within one year after obtaining a FOBT-positive result were categorized in the compliant group, and the other patients were categorized in the noncompliant group.

2) Analysis of performance according to additional screening compliance

We analyzed FOBT positives from 2009 to 2010 according to the classification into the compliant and noncompliant groups.

The patients were followed up for 5 years based on the test date, and the newly diagnosed colon cancer patients were defined based on the date of

cancer diagnosis and summary stage information according to the cancer registry data. Using the cause of death data from Statistics Korea, deaths related to colon cancer were confirmed.

The primary outcomes in our study were positive predictive value, early cancer detection rate, and mortality. To calculate the early cancer detection rate, the 1,000 person-years were estimated based on the follow-up period. A survival analysis was performed to compare the effects of compliance. The statistical significance of all the analysis results was determined at the level of 5%, and SAS 9.4 was used to conduct the analysis.

3) National Colorectal Cancer Screening survey questionnaire

One thousand adults aged 50 years and over were selected for the interview from the general population in each region, excluding Gangwon and Jeju, by sex, age and population size through Proportionate Probability Sampling (PPS). We conducted a personal interview survey using a structured questionnaire from September 2017 to November 2017.

We have designed the questionnaire based on Anderson's model and developed the items related to the national colorectal cancer screening experience and its understanding. In addition, the items of social support, awareness, and attitudes related to colorectal cancer were develop by adapting the SCREEN (The Medical Outcomes Study, Social Support Survey) tool.

To analyze the factors affecting to screening, significant variables in the univariate analysis were included in the multiple logistic regression analysis. SPSS Statistics24 for Windows was used to conduct the analysis.

▢ Results

1) Status and Factor Analysis of Additional Screening for National Colorectal Cancer Screening

The distribution of FOBT positives increased from 143,344 in 2009 to 255,313 in 2013. As of 2013, among the total number of FOBT-positive

recipients, the percentage of men was 53.0% and that of women was 47.0%. The 50–59-year age group accounted for 40.1% of FOBT-positive recipients. 61.2% of the participants were more likely to use private clinics than general hospitals. Among insurance category, the highest group was NHI employee subscribers (65.5%) and the lowest group was medicaid (5.4%). By 2013, the compliance to additional screening was 48.2% in the national cancer screening program, and 58.7% in the healthcare system. There was a difference of about 10% between the screening program and healthcare system.

To analyze the compliance factor of the additional examinations, patients with a history of cancer and those who repeatedly underwent FOBT in the same year were excluded. Finally, 238,235 subjects were included. A higher proportion of men (Odds Ratio (OR)=1.13, 95% Confidence Interval (CI)=1.10–1.16) and younger age (50-59 years OR=3.38, 95% CI=3.21-3.55 vs. 70-79 years OR=2.15, 95% CI=2.05-2.26) contributed to the compliance to additional tests. In addition, compliance to additional screenings was high in the cases with previous experience of additional screening, received FOBT result within 1 year, NHI subscribers, history of stomach/colon disease, and physical activity more than three times a week.

2) Analysis of performance according to additional screening compliance

Between 2009 and 2010, total 258,819 who newly received FOBT-positive were selected. Among them, 142,269 (55%) were followed up by additional tests within 1 year and 16,550 (45%) were not.

The positive predictive value of colorectal cancer was 2.32% among all patients: 0.05% in the noncompliant group and 4.19% in the compliant group. The positive predictive value of polyps was 6.84%: 0.25% in the noncompliant group and 12.27% in the compliant group.

The detection rate of colorectal cancer within 5 years was 5.8 persons per 1,000 person-years (PYS) in the noncompliant group and 10.3 per 1,000 PYS in the compliant group. The detection rate of colon polyps was 17.0 per

1,000 PYS in the noncompliant group and 44.7 per 1,000 PYS in the compliant group.

The localized cumulative detection rate increased from 0.4% at 1-year to 39.0% at 5-year in the noncompliant group. The detection rate in the compliant group tended to be relatively constant from 39.2% at 1-year to 45.5% at 5-year. In the noncompliant group, the regional cumulative detection rate increased from 0.6% within 1 year to 48.7% within 5 years. In the compliant group, the regional cumulative detection rate was 36.2% within 1 year and 41.8% within 5 years.

Also, the 5-year survival probabilities for colorectal cancer specific mortality were 67.9% (95% CI=65.0–70.8) in the noncompliant group and 85.0% (95% CI = 84.1–85.8) in the compliant group. As a result of cox proportional hazard model, the risk of compliance group for cancer specific deaths decreased 0.51 times (95% CI=0.46–0.56) comparing with noncompliant group.

3) National Colorectal Cancer Screening survey questionnaire

The main reasons for undergoing National Colorectal Cancer Screening were “received the notice of the examination from the health insurance corporation” (71.2%), followed by “I am concerned about my health” (9.6%) and “One of the group comprehensive screenings at work” (7.6%). In addition, the main reasons for not receiving the FOBT were 'not feeling the necessity of the test' (43.5%), followed by 'they would undergo another examination first' (16.9%).

In recognition and attitude toward colorectal cancer screening, they showed a positive response to colorectal cancer screening such as “Colon cancer can be treated if it is detected early” and “I want to follow the doctor's opinion about colon cancer screening”. It was low for the risk perception of colon cancer and polyps.

Among the respondents, 94.5% answered that they would undergo additional screening after the FOBT-positive test, and 68.4% of them said

that they would undergo screening at the same medical institution. The main reasons for noncompliance to additional tests were “no physical symptoms” (50.9%), followed by “discomfort during the procedure” (16.4%), and “not enough time to take additional tests” (12.7%).

Using the Korean S-TOFHLA tool, the average understanding of health literacy was determined to be 96.5%, and the understanding of the degree of colorectal cancer screening notice form was 71.4%, which was lower than that of general health information.

Factors associated with cancer screening adherence were investigated after controlling factors. In this analysis, with a one-unit increase in perceived benefit, the likelihood of being adherent to screening increased 1.62 times (95% CI=1.16–2.25). A one-unit increase in physical support and knowledge of colorectal cancer screening increased by 1.25 times (95% CI=1.05–1.49) and 1.56 times (95% CI=1.27–1.91), respectively. A one-unit increase in health related terms increased by 1.62 times (95% CI=1.09–2.41). In the Anderson model, as the age increased, the likelihood of screening increased. And the likelihood of screening was 5.83 times (95% CI=3.67–9.26) higher when the doctor recommended for screening.

▢ Conclusions

According to the national cancer screening statistics, the screening rate of colorectal cancer is lower than that of other cancers. And colonoscopy is more favored than DCBE for additional screening tests after being positive for FOBT. Therefore, it is necessary to continuously monitor and evaluate the effects and risks for colorectal cancer screening.

The purpose of this study was to investigate the current national cancer screening program by linking secondary data sources and to investigate the detection rate of early cancer and mortality. The prevalence of early detection of colorectal cancer and the mortality were high in our study population. However, long-term cohort studies on the effect of screening are needed because of the limitation of the follow-up period due to the nature

of secondary data.

Furthermore, we surveyed the general population aged 50 years and over to evaluate the health literacy and understanding of the cancer screening notice form. General health literacy was high among the elderly persons; however, the understanding of the screening results was insufficient. The strong influencing factor was the doctor's recommendation; therefore, it will be necessary to educate the medical staff to improve the rate of colorectal cancer screening and the understanding of the screening program.

Our study suggests that there is a gap between the screening program and healthcare system. In the future, it will be necessary to establish an efficient system through linkage and management of screening data to provide a system for separately managing high-risk groups such as those with colon cancer or a bleeding risk. Through establishing more efficient screening system, the unnecessary duplication in the screening for colon cancer in the target population could be prevented and managing patients with benign conditions actively could be possible.

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Key words

National Colorectal Cancer Screening, Fecal occult blood test, Colonoscopy, Adherence, Colorectal cancer, Outcomes Research