

## RESEARCH COMMUNICATION

# Predictors of Regular Gastric Cancer Screening among Koreans

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### Abstract

**Objectives:** This study analyzed stages of adoption of gastric cancer screening and explored relationships with the processes of change, pros, cons, and self-efficacy in an effort to assess the barriers to and facilitators of regular gastric cancer screening. **Methods:** The study sample consisted of 650 participants who were at least 40 years old, had no history of cancer, and resided in two urban areas in Korea. Stages of adoption, processes of changes, pros and cons of screening, and self-efficacy were recorded from January 12 to February 16, 2009. Data were assessed by analysis of variance and logistic regression. **Results:** The stage of adoption was determined for 650 respondents, of whom 52 were in the precontemplation stage (8.0%), 209 in the contemplation stage (32.0%), 52 in the action stage (8.0%), and 337 in the maintenance stage (51.8%). Those who underwent regular gastric cancer screening were more committed, more willing to participate in the healthcare system, perceived fewer cons of screening, reported a greater self-efficacy, and perceived gastric cancer risk as moderate. **Conclusions:** Our findings should be helpful for the development of intervention strategies designed to improve recognition of the importance of cancer screening and encourage Koreans to undergo regular screening for gastric cancer.

**Keywords:** Gastric cancer screening - stage of adoption - process of change - pros - cons - self-efficacy - Korea

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### Introduction

Although the incidence of gastric cancer has been decreasing gradually worldwide, it is still the second most common leading cause of cancer death in the world (Parkin et al., 2005). Korea and some parts of East Asia have the highest incidences of gastric cancer in the world (Parkin et al., 2005), especially in Korea, gastric cancer remains the most frequent cancer diagnosis (Ministry of Health and Welfare, 2008).

Although cancer screening is effective at reducing mortality, screening rates have remained low in Korea. In 2002, Korea began screening for gastric cancer as a part of the National Cancer Screening Program (NCSP) for the recipients of medical aid and national health insurance subscribers within the lower 50% contribution rate. In addition, the National Health Insurance Corporation supports 90% of the cost for gastric cancer screening for persons more than 40 years of age who are not eligible for free screening (Ministry of Health and Welfare, 2010). The NCSP recommends biennial upper-gastrointestinal series (UGI) or endoscopic gastric cancer screening for men and women older than 40 years (Choi, 2007). Nevertheless, the rate of participation in gastric cancer screening in 2007 was 45.6%, lower than the rates for breast (45.8%) and cervix (57.0%) (National Cancer Center, Korea, 2008).

To increase the participation rate and decrease the mortality rate from gastric cancer, identification and removal of potential barriers to cancer screening participation might be of importance. Most studies

identifying the factors influencing participation in screening have focused on breast cancer (Chamot et al., 2001; Tu et al., 2002; Ryu et al., 2008;), cervix cancer (Eaker et al., 2001; Tung et al., 2008), and colorectal cancer (Brenes and Paskett, 2000; James et al., 2002; Lawsin et al., 2007; Sung et al., 2008). Although several studies have conducted to identify predictors of gastric cancer screening, these studies regarded behavior change as a finite event (Hahm et al., 2008; Arai et al., 2009; Kwon et al., 2009). The transtheoretical model construes behavior change as a process-involving progress through a series of stages based on past and present behaviors and one's future intentions. It also examines one's processes of change, decisional balance, and self-efficacy. Tailored interventions according to the stage of adoption to increase cancer screening have proved to be more effective than standard interventions (Rakowski et al., 1998; Champion et al., 2003).

In the present study, we analyzed the stage of adoption for gastric cancer screening and explored relationships with the processes of change, pros, cons, and self-efficacy to assess the barriers to and facilitators of gastric cancer screening, while also considering the sociodemographic, health-related characteristics of the participants.

### Materials and Methods

#### *Study sample and survey methods*

A cross-sectional, descriptive design was used for this study. A convenience sample of 650 participants aged 40

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years and older with no cancer history was recruited from two urban areas in South Korea: Seoul and Gyeonggi. All respondents were recruited from subway stations, health promotion centers, and churches. All participants were informed about the purpose of the study and were told that participation was voluntary and anonymous. Persons who agreed to take part in the survey were provided with a self-administered questionnaire that took 15 to 20 minutes to complete during the period from January 12 through February 16, 2009.

*Survey instrument*

The questionnaire included questions regarding sociodemographic characteristics, stage of adoption of gastric cancer screening, processes of change, pros, cons, and self-efficacy. Respondents were first asked if they had had gastric cancer screening on a regular basis. Respondents who had not received screening within 2 years were asked if they were considering having a gastric cancer screening within 2 years. Each respondents answers were classified into one of the four stages: (a) precontemplation (had not had a gastric cancer screening in the last 2 years and didn't plan to have one within 2 years), (b) contemplation (had not had a gastric cancer screening in the last 2 years but was planning on having one within 2 years), (c) action (had a gastric cancer screening in the last 2 years), (d) maintenance (had had at least two gastric cancer screenings on schedule).

The Processes of Change Scale developed by Rakowski et al. (1996) and adapted for a Korean population by Lee (2003) was used to assess the processes of change for gastric cancer screening. This scale consists of four subscales: (a) six items to evaluate the commitment to regular screening (Cronbach's alpha = 0.80), (b) six items to evaluate the information sharing and communication (Cronbach's alpha = 0.68), (c) six items to evaluate the thinking beyond oneself (Cronbach's alpha = 0.69), and (d) three items to evaluate the avoiding contact with the health care system (Cronbach's alpha = 0.59). In the present study, the corresponding values of Cronbach's alpha were 0.84, 0.74, 0.82, and 0.63 respectively. Response was on a 5-point likert scale (1 = strongly disagree to 5 = strongly agree), with higher scores for prior three subscales indicating that the process was more favorable towards gastric cancer screening and for fourth subscale indicating a greater tendency to avoid regular medical visits when feeling healthy.

The Decisional Balance Scale developed by Rakowski et al., (1997) and adapted for Korean population by Lee (2003) was also adopted in this study. This tool consisted of the pros scale which measures agreement with five items assessing the positive benefits of cancer screening (Cronbach's alpha = 0.76) and the cons scale which measures agreement with six items assessing the negative aspects and potential barriers to undergoing gastric cancer screening (Cronbach's alpha = 0.60). In the present study, Cronbach's alpha were 0.82 for pros and 0.72 for cons. Response was on a 5-point likert scale (1 = strongly disagree to 5 = strongly agree).

The Self-Efficacy Scale developed by Champion (2005) was used to assess the belief about individual

ability to exercise control over a set of skills needed to get a gastric cancer screening, which was ten items with higher score indicating the more confidence the individual had to engage in gastric cancer screening (Cronbach's alpha = 0.87). In the present study, Cronbach's alpha was 0.90 and response was on a 5-point likert scale (1 = strongly disagree to 5 = strongly agree).

We also examined several sociodemographics (gender, age, level of education, monthly household income, and marital status), health-related factor (family history of cancer), and cognitive factor (perceived risk of gastric cancer).

*Data analysis*

Frequency analysis and descriptive statistics were applied to the demographic characteristics and the stage of gastric cancer screening behavior change. One-way analysis of variance was performed to assess differences in mean scores of processes of change, pros, cons, and self-efficacy in the different stages of adoption and post-hoc analysis was used to determine at which stages mean differences existed. Multivariate logistic regression analysis was used to estimate predictors of the stage of maintenance after controlling for other variables in the model. All analysis were performed using SPSS 15.0 program.

**Results**

*General characteristics of the study population*

Characteristics of the study population are summarized in Table 1. The mean age of the study population was 53.2

**Table 1. Descriptive Demographic Statistics**

	No	%
Total	650	100.0
Gender		
Male	336	51.7
Female	314	48.3
Age, y		
40-49	225	34.6
50-59	223	34.3
60-69	202	31.1
Education		
<High school	39	6.0
High school grad	240	36.9
College grad	305	46.9
Postgraduate	66	10.2
Monthly household Income, \$		
<2,000	128	19.7
2,000-2,990	135	20.8
3,000-3,990	172	26.5
4,000≤	215	33.1
Marital status		
Uncoupled	82	12.6
Coupled	568	87.4
Cancer family Hx		
No	495	76.2
Yes	155	23.8
Perceived risk of gastric cancer		
Low	224	34.5
Moderate	318	48.9
High	108	16.6

**Table 2. Unadjusted Scores of the Pros, Cons, and Process of Change Measures According to the Stage of Adoption**

	Precontemplation (n=52)		Contemplation (n=209)		Action (n=52)		Maintenance (n=337)		F	P value	Duncan test
	Mean	SD	Mean	SD	Mean	SD	Mean	SD			
Process of change											
Commitment to regular screening	3.21	0.61	3.69	0.58	3.70	0.59	3.99	0.58	32.57	<0.001	1<2=3<4
Information sharing and communication	3.38	0.60	3.84	0.53	3.72	0.44	4.02	0.56	23.37	<0.001	1<2=3<4
Thinking beyond myself	3.09	0.79	3.54	0.66	3.39	0.64	3.78	0.64	20.57	<0.001	1<2=3<4
Avoiding health care system	3.11	0.68	2.93	0.70	3.04	0.57	2.58	0.75	18.04	<0.001	4<1=2=3
Decisional balance											
Pros	3.52	0.61	3.95	0.49	3.80	0.51	4.07	0.57	16.84	<0.001	1<2, 1<3, 3<4
Cons	3.30	0.58	3.48	0.58	3.28	0.65	3.06	0.77	16.63	<0.001	4<1=2=3
Self-efficacy	3.29	0.59	3.73	0.54	3.67	0.52	3.98	0.53	28.99	<0.001	1<2=3<4

years (SD, 8.1; range, 40-69; median, 53.0). In addition, 57.1% of the participants had completed college and nearly 33.0% had a monthly household income equivalent to more than US\$ 4,000. Family history of cancer were reported by 23.8% of respondents. Overall, 34.5% of the participants thought their chance of developing gastric cancer was lower than that of other person of the same age, 48.9% thought their risk was the same, and only 16.6% thought their risk was higher.

*processes of change, pros, cons, and self-efficacy by stage of adoption*

The stage of adoption of gastric cancer screening was defined for 650 respondents, of whom 52 were in precontemplation (8.0%), 209 respondents were in contemplation (32.0%), 52 were in action (8.0%), and 337 were in maintenance (51.8%).

As shown in Table 2, the difference between processes of change, pros, cons, and self-efficacy according to the stage of adoption was statistically significant (p<0.001). The respondents in precontemplation were characterized by the lowest in commitment to regular screening, information sharing and communication, thinking beyond myself, pros, and self-efficacy, whereas the mean scores of the variables were highest for the maintenance group. The mean scores of avoiding contact with the health care system and cons were highest for the precontemplation, while the respondents in maintenance stage showed the lowest mean scores of the variables.

*Factors affecting the maintenance of gastric cancer screening*

A multivariate logistic regression analysis model was used to determine the most important predictors of maintenance of gastric cancer screening in this sample and as the result, five factors were significantly associated with maintenance of gastric cancer screening: perceived risk of gastric cancer, commitment to regular screening, avoiding contact with the health care system, cons, and self-efficacy (Table 3). Moderate perceived risk of gastric cancer was found to be associated with the maintenance of gastric cancer screening. Compared with the lowest risk, the adjusted OR (aOR) of the moderate risk was 1.66 (96% CI: 1.12-2.45). Of the processes of change factors considered, higher commitment to regular screening (aOR, 1.55; 95% CI: 1.03-2.34) and lower avoiding contact with the health

**Table 3. Multivariate Logistic Model Predicting Maintenance of Gastric Cancer Screening**

Parameter	OR	95% CI
Gender Male	1.00	
Female	0.95	0.65-1.38
Age, y 40-49	1.00	
50-59	0.70	0.46-1.07
60-69	1.50	0.95-2.36
Education <High school	1.00	
High school grad	0.86	0.41-1.84
College grad	1.13	0.51-2.46
Postgraduate	1.16	0.45-2.96
Monthly household Income, \$ <2,000	1.00	
2,000-2,990	1.15	0.67-2.00
3,000-3,990	0.79	0.46-1.37
4,000≤	1.28	0.73-2.22
Marital status Uncoupled	1.00	
Coupled	1.14	0.67-1.94
Cancer family Hx No	1.00	
Yes	1.14	0.76-1.72
Perceived risk of gastric cancer Low	1.00	
Moderate	1.66	1.12-2.45
High	1.65	0.98-2.79
Commitment to regular screening Low	1.00	
High	1.55	1.03-2.34
Information sharing and communication Low	1.00	
High	1.21	0.75-1.93
Thinking beyond myself Low	1.00	
High	1.37	0.91-2.06
Avoiding contact with the health care system Low	1.00	
High	0.47	0.33-0.67
Pros Low	1.00	
High	1.04	0.66-1.65
Cons Low	1.00	
High	0.49	0.34-0.71
Self-efficacy Low	1.00	
High	1.57	1.03-2.39

care system (aOR, 0.47; 95% CI: 0.33-0.67) were found to be associated with the maintenance of gastric cancer screening. Analysis of decisional balance factors revealed that respondents who had a lower cons were more likely to be in maintenance of gastric cancer screening (aOR, 0.49; 95% CI: 0.34-0.71). A higher self-efficacy showed the great association with maintenance of gastric cancer screening (aOR, 1.57; 95% CI: 1.03-2.39).

## Discussion

The TTM has proven to be a useful model in assessing the health behaviors of populations with respect to breast, cervical, and colorectal cancer screening (Rakowski et al., 1998; Skinner et al., 1998; Stoddard et al., 1998; Brenes and Paskett, 2000; Chamot et al., 2001; Manne et al., 2002; Tu et al., 2002; Champion et al., 2003; Trauth et al., 2003; Costanza et al., 2005; Lawsin et al., 2007; Menon et al., 2007; Russell et al., 2007; Kang et al., 2008; Ryu et al., 2008; Tung et al., 2008). In these studies, the TTM has been used not only to stage individuals with respect to their willingness to get a cancer screening but also examined the barriers to, and facilitators of, cancer screening. In the present study, we were able to extend the model's application to understanding another type of cancer screening behavior, that is, gastric cancer screening.

We assessed the stages of gastric cancer screening adoption in the study population. About 59.0% of the respondents reported on-schedule screening (action 8.0%, maintenance 51.8%), while 41.0% did not (precontemplation 8.0%, contemplation 32.2%). The rate of gastric cancer screening is greater in this study population than that reported in other population-based study (National Cancer Center, Korea, 45.6%). This may be explained by the higher rate of income level and education level of this study population, which would be expected to increase screening rate due to less cost barrier (Honda & Kagawa-Singer, 2006; Kwak, Choi, Spring, Park, & Park, 2009). Also, Juon (2002) and Soskolne (2007) reported that education attainment was important to having cancer screening because those with a high level of education were more likely to get more information and to have more preventive health behavior than those with low education. Since gastric cancer screening significantly reduces the death rate from gastric cancer (Shiratori et al., 1985; Hisamichi, 1989), a continuing national cancer management campaign for gastric cancer screening should be promoted.

Among the process of change variables, commitment to regular screening and avoiding contact with the health care system were revealed as statistically significant predictive factors. Ryu (2008) confirmed that commitment to regular screening and avoiding contact with the health care system were significantly related to the maintenance stage of mammography and Manne (2002) reported that commitment to screening was positive predictive factor of stage of adoption of colorectal cancer screening. A behavioral and attitudinal interest in having regular gastric cancer screening may force people to get repeat gastric cancer screening and person who has a tendency to avoid regular medical visits when feeling healthy and to

attempt self-treatment when ill rather than go to a doctor seems to be less likely to undergo repeat gastric cancer screening. Regarding this result, it is critical to emphasize the importance of cancer screening and to raise the responsibility for undergoing cancer screening when the message for repeat cancer screening is developed. Cancer screening is usually performed prior to the development of symptoms, thus, it is necessary to heighten the favorable attitude to health care system and positive relationship with medical professionals even when people are feeling healthy.

Study results showed that particular health belief to gastric cancer screening differ across stages of gastric cancer screening adoption, which is consistent the results of previous studies identifying that perceived barriers on mammography were significantly higher in earlier stage of adoption (Chamot et al., 2001; Russell et al., 2007; Ryu et al., 2008). The cons were significantly lower in maintenance stage than in precontemplators, contemplators and actors. This factor encompasses the pain of testing, cost, lack of knowledge about recommended interval, different information about gastric cancer screening, and worry about result as barriers to gastric cancer screening. In order to improve awareness of gastric cancer screening recommendations and minimize irrational fear from misunderstanding, further health communication interventions must provide information addressing the major barriers, misconceptions, and salience of gastric cancer screening.

Self-efficacy was significantly different across stages. Person in the maintenance stage had more confidence in their ability to get screened than did person in the precontemplation, contemplation, and action stages. The importance of self-efficacy in the explanation of stage of adoption and intention to get a cancer screening is supported by the other studies (Tolma et al., 2006; Menon et al., 2007; Russell et al., 2007). These results highlighted the importance of increasing people's self-efficacy by teaching them personal skills to overcome psychological and physical barriers to getting a cancer screening. Bandura (1986) argues that the types of outcomes people anticipate depend largely on their judgments of how well they will be able to perform in a given situation. Increased self-efficacy may enhance their motivation to get a cancer screening.

In our analysis, perceived risk of gastric cancer was independent predictor of routine gastric cancer screening. Respondents who judge their chance of developing gastric cancer as lower than average person were less likely to be on on-schedule of gastric cancer screening. This is consistent with previous researches showing a relationship between perception of cancer risk and intention or actual cancer screening utilization (Clemow et al., 2000; Honda, 2004; Tessaro et al., 2006; Palmer et al., 2007; Soskolne et al., 2007). Although gastric cancer is the most common form of cancer in Korea, 34.5% of the participants in our study underestimated their personal risk. Marlow (2009) reported information delivery about cancer affected the cancer risk perception, thus, increasing awareness of causes of gastric cancer and the importance of gastric cancer screening should be emphasized to raise the

rate of gastric cancer screening. However, we need to approach carefully to the extent of raising the level of risk perception. In this result, high level of risk perception was not significantly associated to regular gastric cancer screening since it seems that people who are very worried about getting cancer are less likely to attend for screening. Cancer worry was strongly associated with the perceived risk for gastric cancer (Sutton et al., 1994).

Our study has a number of limitations. First, since this study population was drawn from convenience sample in certain geographic areas, caution is warranted in generalizing these findings to a larger population and other community settings. Second, the cross-sectional design of this study precludes any conclusions about whether the observed associations were causal, thus, further work is necessary to confirm that constructs of TTM influence classification according to screening stage. Third, we did not distinguish between screening and diagnostic stomach cancer screening, thus the actual examination rate may have been overestimated, especially given data were self-reported. Finally, although the most comprehensive definition for staging employed both past cancer screening behavior and intention to continue having cancer screening in the future, we didn't ask respondent who had received within 2 years the intention to get a gastric cancer screening in the future, which results that we couldn't identify the stage both relapse and relapse risk. Nevertheless, our study may be useful for several contributions. First, this is the first study that applies the TTM to understanding gastric cancer screening behavior in a community setting. Second, our study allows practitioners to discuss gastric cancer screening with each individual and respond considering their barriers and facilitators of gastric cancer screening.

In Conclusions, Our results demonstrate that scores reflecting process of change, pros, cons, and self-efficacy are associated with gastric cancer screening among Korean. Our findings may be helpful for the development of intervention strategies designed to improve Korean's recognition of the importance of screening and intention to undergo regular gastric cancer screening.

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*Predictors of Regular Gastric Cancer Screening among Koreans*

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