Predictors of Pre-hospital Delay among People with Colorectal Cancer

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Abstract: Colorectal cancer is one of the leading cancers among Thai people. Delay in cancer diagnosis can lead to poor prognosis and survival, and one concern is pre-hospital delay. The purpose of this study aimed to describe time delays in diagnosis including pre-hospital and in-hospital delays and examine predictors of pre-hospital delay. From June to August 2021, two hundred and forty people with colorectal cancer were recruited from three regional hospitals in Thailand. Data were collected using the Personal Information Sheet, Colorectal Cancer Knowledge Questionnaire, Modified Illness Perception Questionnaire, Healthcare Seeking Behavior Questionnaire, and Perceived Seriousness of Warning Signs and Symptoms Questionnaire. Descriptive statistics, Pearson's and Spearman's correlation coefficients, and multiple regression analysis were used in data analysis.

Results revealed that total time delays in diagnosis were between 4 to 656 days. Pre-hospital delay varied between 1 to 632 days, and in-hospital delay ranged from 2 to 315 days. Medians of total time delays in diagnosis, pre-hospital delay, and in-hospital delay were 87.50 days, 32 days, and 28.50 days, respectively. Knowledge about the colorectal cancer screening method was the strongest predictor, and jointly with healthcare seeking behavior about self-medicating, illness perception including consequence of disease and symptoms, and rehappened symptoms significantly predicted and explained 48.70% of the variances in pre-hospital delay. Implications for nursing practice should focus on improving knowledge of the disease, modifying illness perceptions, and enhancing healthcare seeking behaviors to decrease pre-hospital delay. This intervention should be tested through an experimental study.

Pacific Rim Int J Nurs Res 2022; 26(3) 446-460

Keywords: Colorectal cancer, Health seeking behavior, Illness perception, Knowledge, Pre-hospital delay, Time delays in diagnosis

Received 6 February 2022; Revised 21 March 2022; Accepted 3 April 2022

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Introduction

Globally, colorectal cancer (CRC) is the third common cancer found, and the second rank of mortality rate among people.[1] Incidence rates of CRC are mostly found in Asia (52.3%), followed by Europe (26.9%), Northern America (9.3%), Latin America and the Caribbean (7%), and Africa (3.4%), respectively.[1]

Colorectal cancer is the third frequently diagnosed cancer among men and the second cancer among women, and the fourth rank of mortality rate among Thai population.[2] The survival rate is high if CRC is detected early. If the cancer is inside the colon or rectum, 89-91% of people may survive at least 5 years.[3] Unfortunately, 31-40% of Thai people with colorectal cancer (PW-CRC) are in advanced stages such as stage III or IV.[4] Only 4-9% of them are in stage I and 17%-22% in stage II.[4]

Time delays in diagnosis refers to the interval starting from symptom onset perceived by a person to the confirmed CRC diagnosis date.[5-8] These delays consist of two phases: pre-hospital delay and in-hospital delay. The pre-hospital delay is the duration from symptom onset that a person perceived to the first visit to a physician. The in-hospital delay refers to the duration from the first visit to a physician to the confirmed CRC diagnosis date. Published articles define time delays in diagnosis differently ranging from 28 days to 3 months.[6,9] However, an early diagnosis is highly recommended.

Previous studies report that pre-hospital delay in PW-CRC remains a problem. A qualitative design found that PW-CRC visited a physician after they experienced stomach pain for six weeks. Some PW-CRC go to see the physicians after they have bleeding from the rectum and change in frequency, consistency (diarrhea or constipation), or in caliber of the stools for more than six months.[10] Compared with other cancers, such as lung cancer, breast cancer, and melanoma cancer, pre-hospital delay of PW-CRC is longer.[11,12] In Thailand, pre-hospital delay of PW-CRC is between 60 and 61 days.[7,13]

Concerning the issue of COVID-19 pandemic in Thailand in 2021 when this study was undertaken, the country was successful in controlling COVID 19 infection. This was due to several mechanisms driven by government agencies, health authorities, academic institutes, and the public. Not all country health systems were not affected, and the usual care of patients were not disrupted. Hospitals across Thailand provided care for cancer patients such as diagnosis, chemotherapy, surgery, and radiation. This issue did not affect diagnosis and treatment delays.

CRC diagnosis is a complex process. First, PW-CRC begin to perceive symptoms. Second, they undergo a consultation with a general practitioner. Third, they are referred to a specialist. Fourth, they wait and spend a period for diagnostic procedures, such as colonoscopy. Finally, they get a confirmed diagnosis with CRC.[6,14,15] All this contributes to the idea that time to CRC diagnosis might be delayed, which mostly depends on the health care organization.

Primary care is mainly the first point of contact for people with gastrointestinal symptoms such as rectal bleeding and altered bowel habits. CRC is sometimes not an immediate diagnosis since those symptoms could be attributable to benign, and other illnesses. People might determine whether those symptoms warrant presentation to health personnel, or they might adopt of a "wait and see approach."[7,10,14] Time delays in diagnosis among PW-CRC could occur including pre-hospital and in-hospital delay,[6,14] and could lead to poor prognosis and a high mortality rate among PW-CRC.[16-19] Thus, knowledge about factors contributing to time delays in diagnosis is important, especially pre-hospital delay.

However, there are few studies describing time delays in diagnosis in Thailand. In addition, these studies are limited in generalizations of the findings because of a small sample size, and data were collected from only one setting.[7,13] Thus, this study aimed to describe the duration of time from the symptom onset to seeking healthcare (pre-hospital delay) and its predictive factors as well as total time delays in diagnosis.

Conceptual Framework and Literature Review

This study was guided by the framework of Dracup et al.,[20] which is based on the self-regulation model of illness behavior of Leventhal et al.[21] This

framework explains various factors influencing people's decisions to seek healthcare.[20] The central concepts consist of internal and environmental stimuli, cognitive and emotional representations, action plans for coping with problems and emotions, appraisal, and outcomes.[20,22] The main outcome is pre-hospital delay.[20]

According to Dracup et al.,[20,22] seeking treatment behavior is the decision-making of people acting in response to representations of threat. Symptom experiences serve as a stimulus. When people perceive symptoms as threats, they use abstract and concrete semantic memories to label symptoms (identify), perceive causes and timeline of symptoms, believe in the ability to control, and the consequence of symptoms. Those cognitive representations are influenced by knowledge, attitudes, and beliefs, which knowledge would help people interpret their symptoms correctly, and thus they might visit a physician promptly. Emotional representation may occur in parallel, or independent of the cognitive process, and could influence people's decision-making to seek healthcare. People may seek healthcare with different strategies to eliminate symptoms. If they believe that symptoms are common diseases and are not related to cancer, they might use self-treatment, culturally prescribed nostrums, caring through family remedies, medically prescriptions, or wait for symptom relief.[5,20] Then, the effectiveness of actions or coping strategies would be appraised by people. If they appraise those symptoms as not serious, this could lead to a delay in seeking treatment which is pre-hospital delay.[20]

In the current study, the pre-hospital delay derives from outcome concept. Several factors derived from those central concepts contribute to PW-CRC seeking treatment and being involved with pre-hospital delay. The linkage between selected factors and pre-hospital delay is described next.

CRC knowledge acts as internal stimuli.[20,22] Knowledge about CRC refers to the knowledge about symptoms related to CRC, risk factors of CRC, age at risk for CRC, and CRC screening methods. Sufficient knowledge about CRC made PW-CRC interpret their symptoms correctly.[23] As a result, PW-CRC respond to symptoms in various methods such as seeking treatment, or an early presentation to a physician. PW-CRC with higher knowledge are more likely to present to physicians earlier than those with lower knowledge,[24] whereas lack of knowledge and concern about risks associated with the symptoms since people first notice symptoms increases pre-hospital delay.[14]

Cognitive illness perception acts as cognitive representation.[20,25] Cognitive illness perception refers to the perception, thinking, or beliefs about identity, timeline (acute /chronic), consequences, personal control, treatment control, illness coherence, timeline cyclical, and cause when experiencing CRC symptoms. According to Dracup et al.,[20] people are less likely to visit a physician if they believe that the symptoms are not related to cancer, symptoms may not last long, may disappear, or do not affect daily living. Therefore, PW-CRC might not visit a physician. Moreover, PW-CRC, perceived those symptoms are cyclical or get better or worse, and are likely to increase pre-hospital delay than those without cyclical symptom perception. Those who believe in treatment control often have a decrease in pre-hospital delay.[25]

Emotional illness perception is derived from emotional representation,[20] which refers to reactions affected by disease and its symptoms, and influence peoples' decision-making to seek healthcare. Emotional responses such as fear, worry about the finding of diagnosis, embarrassment about symptoms, anxiety, or depression are related to increasing pre-hospital delay.[20] These emotions interact with health-protective behaviors, strategies to respond to symptoms, and eventual decision to visit a physician.[25]

Walter et al.[26] reported that depression and anxiety are associated with increase pre-hospital delay among PW-CRC compared to those without these emotions. Fear is also reported as a factor related to pre-hospital delay.[14,24] Embarrassment is related to increase pre-hospital delay.[14] Several studies reported that

PW-CRC who think that colonoscopy would be an embarrassing procedure not likely to visit healthcare providers.[14,19,27] Since colonoscopy is an invasive procedure, it may scare people.[28]

Healthcare seeking behavior is derived from seeking treatment behavior concept.[20] It refers to actions, behaviors, responses taken when people perceived symptoms. Healthcare seeking behavior consists of five dimensions: self-medicating, complementary and alternative medicine (CAM), counseling, emotional-focused coping, and problem-focused coping. PW-CRC, who successfully eliminate symptoms by self-treatment or wait and see approach, might not visit a physician leading to an increased pre-hospital delay.[10,20]

Perceived seriousness of warning signs and symptoms is derived from the appraisal stage.[20] PW-CRC who appraise a symptom as serious would promptly seek appropriate medical attention by visiting a physician for diagnosis and treatment.[8] If they appraise those symptoms are not serious, they might not visit a physician leading to an increased pre-hospital delay and treatment delay.[14,28]

PW-CRC could be cured by surgery if detected in an early stage. Previous studies revealed that the PW-CRC's median of pre-hospital delay varied from 13-14 days[8] to 91 days.[28] Dobson et al.[10] found that PW-CRC visited a physician after they experienced stomach pain for six weeks. Some of them had rectal bleeding and changes in bowel habits longer than six months before visiting a physician at hospital. A study among 191 Thai PW-CRC[7] found that median of time delays in diagnosis is 246 days with pre-hospital delay and in-hospital delay being 61 and 89 days, respectively. A secondary analysis study[13] revealed that 77% of PW-CRC had pre-hospital delay of 60 days. However, predictors of prehospital delay among PW-CRC are limited

Study aims

To 1) investigate time delays in diagnosis, both pre-hospital delay and in-hospital delay; and 2) determine whether cognitive factors (CRC knowledge, cognitive illness perception, emotional illness perception, perceived seriousness of warning signs and symptoms), behavioral factors (healthcare seeking behavior) could predict pre-hospital delay among Thai PW-CRC.

Methods

Design: A retrospective, cross-sectional research design was employed. This study is reported here using the STROBE Statement used for cross-sectional studies.[29]

Sample size calculation: The sample size was determined using the power table of Cohen.[30] The power of test was .80, the alpha value of .05, the effect size of 0.24 based on a previous study.[13] The calculated sample size was 200, and 20% of the calculated sample size was added for possible attrition of participants.[31] Therefore, the total sample size was 240 participants.

Sampling: Multi-stage random sampling was applied. First, a name list of all public hospitals providing services for PW-CRC across Thailand, including Bangkok Metropolitan and five regions, were searched. The researchers categorized these hospitals into 17 super-tertiary hospitals, 37 advanced-level hospitals (A-level), 15 standard-level hospitals (S-level), and one middle1-level hospital (M1-level). However, the middle1-level hospital was excluded because there were too few PW-CRC.

Next three geographic regions were selected using a lottery without a replacement. The Bangkok Metropolitan, Eastern, and Northeastern regions were selected, then three hospitals were selected using a lottery without replacement. The results were one university hospital in Bangkok Metropolitan, one A-level hospital in Eastern region, and one S-level hospital in Northeastern region were selected.

Potential participants were PW-CRC visiting medical and surgical out-patient departments, oncology, radiology and endoscopic units, and in-patient departments at the three public hospitals. A systematic random sampling using a table of random digits was employed to recruit potential participants.

Inclusion criteria were aged 18 years and over, having at least one warning sign and symptom of CRC, having pathologically confirmed CRC diagnosis, knowing that they were diagnosed with CRC, no history of psychiatric illness, dementia, or Alzheimers, and being able to cooperate and communicate well.

The participants were excluded if they were diagnosed with CRC recurrence. The participants experiencing symptoms such as dizziness, hypotension, dyspnea, or need to be admitted during collecting data were also excluded.

Instrumentations: Five instruments were used for data collection. Permission to use all questionnaires was obtained from the original developers. Three instruments, including Colorectal Cancer Knowledge Questionnaire, Perceived Seriousness of Warning Signs and Symptoms Questionnaire, Modified Illness Perception Questionnaire-Revised (IPQ-R) were translated from English into Thai by the primary investigator (PI) using the forward-back translation method of Sperber.[34] The content validity of all instruments was validated by a panel of seven judges, including two physicians who were specialists in gastrointestinal surgery, four nursing professors in oncological nursing, and one advanced practice nurse (APN) in oncological nursing.

All these instruments were then tested for reliability in 30 Thai PW-CRC who had the same characteristics with the main participants but were not included in the main study. Scale content validity index (CVI), reliability, an item example of instruments in the pilot test and the main study are shown in **Table 1**.

Table 1. The CVI, reliability, number of items, example item, and scale format of the research instruments

Instruments and number of items	CVI	Reliability			Example item	Scale format	Possible range
		Type of reliability test	n (30)	n (240)			
Colorectal Cancer Knowledge Questionnaire (22 items)	0.95	KR-20	0.78	0.75			0-22
- CRC symptom (10 items)					Rectal bleeding	Correct/ Incorrect	0-10
- Age at risk for CRC (1 item)					People aged ≥ 50 are a high-risk group of CRC	Correct/ Incorrect	0-1
- CRC risk (10 items)					Having a first-degree relative history of CRC	Correct/ Incorrect	0-10
- CRC screening methods (1 item)					CRC screening can be done in several ways, including FBT, colonoscopy	Correct/ Incorrect	0-1
Modified Illness Perception Questionnaire-Revised (61 items)	0.97						
Cognitive domain							
- Identity sub-scale (11 items)		KR-20	0.71	0.72	Symptom as following related to my disease e.g., dark or black stool	Yes-No format	0-11
- Timeline acute vs. chronic (7 items)		α	0.71	0.71	I thought the symptom would last for a long time	5-Likert scale	7-35
- Consequence sub-scale (4 items)		α	0.79	0.80	My symptom had serious financial consequence	5-Likert scale	4-20
- Personal control sub-scale (4 items)		α	0.67	0.71	There was a lot I could do to control my symptom	5-Likert scale	4 -20
- Treatment control sub-scale (3 items)		α	0.75	0.78	I thought treatment would be able to control my symptom	5-Likert scale	3-15

Table 1 The CVI, reliability, number of items, example item, and scale format of the research instruments (Cont.)

Instruments and number of items	CVI	Reliability			Example item	Scale format	Possible range
		Type of reliability test	n (30)	n (240)			
- Illness coherence sub-scale (5 items)		α	0.72	0.74	My symptom was a mystery to me	5-Likert scale	5-25
- Timeline cyclical subscale (4 items)		α	0.81	0.82	My symptom came and went in a cycle	5-Likert scale	4-20
- Cause sub-scale (18 items)		α	0.70	0.71	Stress or worry	5-Likert scale	18-90
Emotional domain (5 items)		α	0.84	0.84	I got depressed when I thought about my symptom	5-Likert scale	5-25
Healthcare Seeking Behavior Questionnaire (20 items)	0.92	α	0.71	0.76			
- Self-medicating (3 items)					Took an over-the-counter medicine (OTC) such as antacid, laxative, or stomach pain reliever	No/Yes with 3-rating scale	0-9
- CAM (3 items)					Use herbs or traditional medicine	No/Yes with 3-rating scale	0-9
- Counseling (5 items)					Discussed about symptoms with family members, friends, co-workers, or acquaintance	No/Yes with 3-rating scale	0-15
- Emotional-focused coping (6 items)					Wished symptoms would go away	No/Yes with 3-rating scale	0-18
- Problem-focused coping (3 items)					Tried to control symptoms by altering diet, such as eating on time, low meat, high vegetable	No/Yes with 3-rating scale	0-9
Perceived Seriousness of Warning Signs and Symptoms Questionnaire (11 items)	0.97	α	0.80	0.85	Bloody mucous	5-rating scale	11-55

Note: α = Cronbach's alpha coefficients, KR-20 = Kuder-Richardson 20

A *Personal Information Sheet* was developed by the principal investigator (PI), consisting of 18 items assessing 1) demographic data such as age, gender, education levels, and income, 2) clinical data including a personal history of polyps, personal history of inflammatory bowel disease, hereditary CRC syndrome, type of CRC, pathological findings, and stage of CRC.

The *Time to Diagnosis Questionnaire* was also developed by the PI. It consists of two items measuring pre-hospital delay and in-hospital delay. Pre-hospital delay is assessed by time interval (in days) from the first date that the participants perceived or noticed symptoms to the first date that they presented to a specialist physician ordering a colonoscopy. In-hospital delay is assessed by time interval (in days) from the first date that the participants present to a specialist physician ordering a colonoscopy to the date that the CRC diagnosis was confirmed by pathological findings. Example items are "What is the first date that you noticed of symptom begin?" and "What was the date you first visited a specialist physician who ordered a colonoscopy?" (date, month, year). Using the medical record of participants, the researcher records on the questionnaire the first date of pathologically-confirmed CRC. Total time delays in diagnosis are the sum between pre-hospital delay and in-hospital delay.

The *Colorectal Cancer Knowledge Questionnaire*. The English-version of this questionnaire was originally developed by Hashim et al.[33] to measure CRC knowledge. It has 22 items consisting of 4 sub-scales including CRC symptoms, CRC risk factors, age at risk for CRC, and CRC screening methods. Responses are scored as the correct answer (equal to 1) or the incorrect answer (equal to 0). The total score ranges from 0 to 22 which would be categorized into the low level (0 to 12) and high level (13 to 22).

The *Modified Illness Perception Questionnaire-Revised (the Modified IPQ-R)*. The English-version of this was developed by Hvidberg et al.[34] In this study, this instrument was employed to measure both cognitive illness perception and emotional illness perception factors. The questionnaire contains 61 items consisting of cognitive and emotional domains.

The *Cognitive Illness Perception* is measured using cognitive domain of Modified IPQ-R. It consists of 8 sub-scales: identity, timeline acute/chronic, consequence, personal control, treatment control, illness coherence, timeline cyclical, and causes sub-scales. The Identity sub-scale is comprised of 11 lists of commonly occurring CRC-related symptoms and asks participants if they believe the symptom is specifically involved with the disease. The Identity sub-scale is rated using Yes (1) and No (0) format. Other sub-scales are rated on a 5-point Likert Scale ranging from strongly disagree (1) to strongly agree (5).

High scores on identity, timeline acute/chronic, consequence, personal control and treatment control, illness coherence, and timeline cyclical indicate strongly held beliefs about the number of symptoms involved in the disease as perceived by the participants, the chronicity of symptoms, the negative consequences of symptoms, positive beliefs about the controllability of symptoms by themselves and a physician, positive beliefs about a personal understanding of symptoms, and nature of symptoms recurring cyclically, respectively. Lastly, higher scores on the Causes sub-scale indicates strong beliefs in the reasons as causes for symptoms.

The *Emotional Illness Perception* was measured by emotional domain of the Modified IPQ-R. It consists of 5 items measuring depression, upset, angry, anxiety, and fear/afraid. Each item is responded to using a 5-point Likert scale ranging from strongly disagree (1) to strongly agree (5). Higher scores on the emotional sub-scale indicate a higher level of negative emotional illness perception.

The *Healthcare Seeking Behavior Questionnaire* was developed by the PI using an extensive literature review. The questionnaire consists of 20 items with 5 dimensions that investigate self-medicating, complementary therapy and alternative medicine: CAM, counseling, emotional-focused coping, and problem-focused coping, and additional one open-ended item. PW-CRC are firstly asked to rate whether they perform a healthcare seeking behavior in the questionnaire. The response to the questionnaire is No (0) and Yes (1). If the participant answers yes, they are later asked for the frequency of each behavior using a 3-point rating scale, ranging from practice rarely (1) to practice regularly (3). The higher the score of each dimension, the more behaviors PW-CRC performs when experiencing CRC-related symptoms.

The *Perceived Seriousness of Warning Signs and Symptoms Questionnaire*. The English-version of this was developed by Leiva et al.[28] to measure perceptions about the degree of seriousness of warning signs and symptoms of CRC. The questionnaire consists of 11 items with a 5-point rating scale format, ranging from not at all (1) to extremely (5). Total scores ranged from 11 to 55. A higher score indicates a higher perception of seriousness of warning signs and symptoms of CRC perceived.

Ethical considerations: This study was approved by the Research Ethics Review Committee of Chulalongkorn University, Thailand (COA No. 144/2564), and the Institutional Review Board of all study hospitals (COA No. Si 383/2021, COA No. 09/ 2564, and MH 0032.2/ 2278). Once approval was obtained, potential PW-CRCs were approached by a nurse, outside of the research team, who screened them for eligibility for the study

and asked them if they would be interested in participating. The PI interviewed PW-CRC who met the inclusion criteria and provided information about the purpose of the study, its risks, and benefits, and that they could withdraw at any time. Confidentiality of information was assured. Written consent to participate was then obtained from PW-CRC to retrieve information from their charts.

Data collection: The PI collected the data from June 2021 to August 2021. A total of 240 PW-CRC attending medical and surgical out-patient departments, oncology units, radiology and endoscopic units, and in-patient departments participated. The PI collected the data by herself. No research assistance was used in this study.

Data analysis: Data were analyzed by the Statistical Package of the Social Science (SPSS) for Windows 22 (Licensed software from Chulalongkorn University). Descriptive statistics were used to analyze the demographic data, illness-related data, and study variables. Total time delays in diagnosis, including pre-hospital delay and in-hospital delay, were analyzed using median because the data were not normally distributed.

A preliminary analysis was tested to check underlying assumptions (such as independence of errors, linearity, homoscedasticity, multicollinearity). All assumptions were met. Pre-hospital delay had skewness to right. Therefore, transformation to Logarithm using natural log (logN) was used before statistical analysis in regression. The multivariate outlier was tested using Mahalanobis distances, and two cases of outlier were removed before running a regression analysis. Thus, 238 cases were used for analysis in the regression model. Pearson's and Spearman's correlation coefficients were used to describe the association among variables. The stepwise regression method was used to test the predictive model of pre-hospital delay.

Results

All of 240 PW-CRC accepted to participate in this study. Their characteristics included their mean age was 58.77 years (SD = 10.44), more than half were males (57.92%), married (70.83%), and 54.17% were using universal health coverage. Most were non-drinkers (63.33%) and non-smokers (70.83%). About a half of the study participants (52.92 %) had comorbidities, and 20.83% reported comorbidity related to CRC (e.g., diabetes mellitus, peptic ulcer, and gastroesophageal reflux disease). Finally, many of them had no family history of cancer (76.25%). Regarding type of CRC cancer, colon cancer was mainly found in the participants (61.67%). Almost half were diagnosed at stage III (46.67%), followed by stage IV (36.66%). Only 0.42% and 16.25% were diagnosed at stage I and stage II, respectively.

The total time delays in diagnosis of 240 PW-CRC, both pre-hospital and in-hospital delays, are shown in **Table 2.**

Table 2 Time delays in diagnosis of the study participants (n = 240)

Time interval (days)	Min	Max	Mean	SD	Mode	Median	IQR	Ske	Kur
Pre-hospital delay	1	632	77.49	103.55	31	32.00	77	2.411	6.221
In-hospital delay	2	315	39.10	38.85	7	28.50	39	3.285	16.855
Time delays in diagnosis (Total interval)	4	656	116.86	107.92	22	87.50	88	2.020	4.448

As shown in **Table 3,** chronic constipation and rectal bleeding were the most frequently reported symptoms presentation by the study participants. However, dark or black stools and a decrease in appetite were rarely reported. Concerning total time to diagnosis and pre-hospital delay, the study participants who reported "a lump at the anus" had the longest period. Of in-hospital delay, the participants with rectal bleeding reported the longest duration.

Table 3. Time delays in diagnosis sorted by symptoms on presentation of the study participants (n = 240)

Symptoms	Frequency	%	PD (Median)	HSD (Median)	TDT (Median)
Chronic constipation/diarrhea	58	24.16	62.00	30.50	123.50
Rectal bleeding	56	23.33	28.00	38.50	76.50
Abdominal pain/tummy ache	49	20.42	22.00	23.00	59.00
Gut obstruction	18	7.50	13.50	17.50	38.50
Bloating up/indigestion	13	5.42	152.00	16.00	166.00
Tenesmus	13	5.42	39.00	31.00	77.00
Mucous bloody	8	3.33	47.50	35.50	84.00
Change in bowel habit	6	2.50	117.50	14.50	147.50
A lump at the anus	4	1.67	365.00	27.50	390.50
Fatigue/tiredness	4	1.67	161.50	10.50	181.00
Unintentional weight loss	3	1.25	180.00	14.00	272.00
Blood in the stool	3	1.25	47.00	28.00	100.00
Dark or black stools	3	1.25	37.00	18.00	70.00
Decrease in appetite	2	0.83	124.00	8.50	132.50

*PD = Pre-hospital delay, HSD = In-hospital delay, TDD = Total time delays in diagnosis

The correlation among variables is shown in **Table 4.** Five factors were significantly positively associated with pre-hospital delay, including some sub-scales of cognitive illness perception (timeline-acute vs. chronic, illness coherence, timeline cyclical), emotional illness perception, and healthcare seeking behavior about self-medicating. Meanwhile, three factors were significantly negatively associated with pre-hospital delay, namely, one sub-scale of CRC knowledge was CRC screening method, consequence sub-scale of cognitive illness perception, and the personal factor of gender (p-value < 0.05).

Table 4 Pearson and Spearman rank correlation coefficients between personal factors, selected factors, and pre-hospital delay (n = 238)

Factors and sub-scales	Pre-hospital delay (r)	p-value
CRC Knowledge		
- Symptom of CRC	-.044	.435
- Age-related risk of CRC	-.038	.618
- Risk factor of CRC	- .012	.824
- CRC screening method	-.880	.000
Cognitive illness perception		
- Identity	-.040	.566
- Timeline (acute/chronic)	.151	.017
- Consequence	-.630	.000
- Personal control	-.036	.064
-Treatment control	.096	.087
- Illness coherence	.149	.020
- Timeline (cyclical)	.780	.000
- Cause	.106	.104
Emotional illness perception	.141	.030

Table 4 Pearson and Spearman rank correlation coefficients between personal factors, selected factors, and pre-hospital delay (n = 238) (Cont.)

Factors and sub-scales	Pre-hospital delay (r)	p-value
Healthcare-seeking behavior		
- Self-medicating	.580	.000
- Complementary and alternative medicine (CAM)	.077	.120
- Counseling	-.100	.136
- Emotional-focused coping	-.034	.599
- Problem-focused coping	-.066	.321
Percieved seriousness of warning sings and symptoms	-.086	.186
Personal factors		
- Gender	(rs) -.160	.014

p < .05

Predictors of pre-hospital delay are shown in **Table 5.** It was found there were four predictors; CRC knowledge about the CRC screening method, two sub-scales of cognitive illness perception, including consequence sub-scale and timeline cyclical sub-scale, and healthcare-seeking behavior about self-medicating could jointly predict and explain 48.70% of the variance in pre-hospital delay among PW-CRC.

Table 5 Predicting factors of pre-hospital delay among the study participants using Stepwise multiple regression analysis (n = 238)

Predictors	Coef (b)	SE Coef	Beta	95%CI	t-value	p-value
Constant	.851	.136		(.583, 1.118)	6.255	.000
CRC knowledge of screening method (sub-scale)	-.243	.063	-.257	(.038, .287)	-3.889	.000
Consequence (sub-scale)	-.163	.063	-.163	(.016, .277)	-2.588	.010
Timeline cyclical (sub-scale)	.176	.060	.193	(.057, .294)	2.941	.003
Self-medicating	.149	.062	.157	(.111, .371)	2.396	.017

ANOVA (F = 93.889 p-value= .01), R Squared (R^2) = .487 Adjusted R Squared = .482
SE= .446 R Squared Change = .007, Durbin-Watson = 1.603

Discussion

Time delays in diagnosis: The median of time delays in diagnosis (total interval), pre-hospital delay, and in-hospital delay of the current study was equal to 87.50 days ((IQR = 88)), 32 days (IQR = 77), and 28.50 days (IQR = 39), respectively. Previous studies in Thailand [7] reported that the median of time delays in diagnosis was 246 days, which is longer than the findings of the current study. Compared with developed countries in Europe, total time delays in diagnosis of Thai PW-CRC are longer than the Netherlands[11] (median = 54 days) and Hungary [6] (median = 41 days). However, this is shorter than those in United Kingdom,[26] and Spain[28] with a median of 136 and 131 days, respectively.

Of pre-hospital delay, the median of the current study (32 days) is shorter than those of previous studies (60 and 61 days) in Thailand.[7,13] The median of pre-hospital delay of the current study is close to those of developed countries,[6,26] but shorter than Spain PW-CRC (median = 91 days).[28] Though there are no

gold standard criteria for time delays in diagnosis for CRC, the Dutch Cancer Society and American Cancer Society suggested that the pre-hospital delay should be no later than 28 days.[13] The findings of the current study revealed that the pre-hospital delay is still delayed.

Of the in-hospital delay, the median of the current study was 28.50 (IQR = 39). A previous study conducted in Thailand[7] reported the median was equal to 89 days, so the in-hospital delay of the current study is shorter. Total time delays in diagnosis in the current study is shorter than time of previous studies in Thailand.[7,13] It might be because data of the current study come from super-tertiary, A-level, and S-level hospitals in Thailand. These hospitals are able to provide treatment for PW-CRC quickly. They have gastrointestinal specialists, endoscopic units, and advanced treatments. Thus, PW-CRC can easily access health services, and they can visit medical specialists for CRC diagnosis earlier without a waiting time for referral as seen in previous studies. Moreover, the settings of the current study were in each region of Thailand located nearby hometowns of PW-CRC. In a previous study[15] PW-CRC visited medical specialists at hospitals located far from their homes. Some PW-CRC had to travel for 1280 kms.

Findings of the current study are different from those of Western countries. It might be because their contexts, such as healthcare system, accessibility to healthcare services, medical coverages, geographical locations, and transportation vary.[6,9,15,35]

Predictors of pre-hospital delay: Linear regression models showed that the strongest predictor of pre-hospital delay among PW-CRC is knowledge about the CRC screening method. Moreover, knowledge about the CRC screening method can jointly with some sub-scales of cognitive illness perception (consequence and timeline cyclical sub-scales) and healthcare seeking behavior (self-medicating) significantly predict and explain 48.70% of the variance in pre-hospital delay among PW-CRC.

A negative coefficient demonstrated whenever the CRC knowledge about the screening method increase, pre-hospital delay tended to decrease. Knowledge about CRC screening method gained by people can contribute to their understanding of CRC. CRC can be prevented by early detection.[36] Our findings support previous studies[24] that PW-CRC with higher knowledge are more likely to visit physicians earlier than those with lower knowledge.

Another predictor of pre-hospital delay is the consequence of disease and its symptoms and an individual's ideas regarding the expected effect of CRC on their life. The current findings show that PW-CRC, who perceived negative consequences of their symptoms, tended to decrease pre-hospital delay. Likewise, previous studies [25] have revealed that the more PW-CRC perceive the consequence of CRC symptoms as threatening, the shorter the pre-hospital delay.

Timeline refers to an individual's thoughts about the duration of their illness and whether it would be a short-term or a long-term problem. Timeline cyclical is the person's perceptions of CRC recurring in cycles, such as coming and going in a cycle or getting better and worse. The results are consistent with previous studies[25] that found PW-CRC who had strong beliefs about the timeline cyclical of symptoms are more likely to take time to visit a physician, while the PW-CRC who strongly perceived negative consequences of CRC- related symptoms are more likely to take a shorter time to visit a physician.

Self-medicating is the use of medicines without a doctor' prescription by one's intention or another person's advice. It is a predictor of pre-hospital delay. Even though self-medicating with non-prescription drugs could alleviate minor ailments, it has negative effects. One of the problems of self-medication is that it might lead to delays in seeking appropriate care. When the participants get sick, they perceive that their illness is mild. They go to community pharmacy to purchase and use medicines. Some pharmacies offer the service without requesting a prescription and

medical diagnosis. This implies individuals impose their subjective judgment in determining their diagnosis.[10,20]

Factors such as gender (female), timeline (acute/chronic), illness coherence, and emotional illness perception could not jointly predict pre-hospital delay. It might be due to women taking more responsibility in their families and having no available time to visit a physician.[15] Some PW-CRC thought that symptoms would be chronic, not serious,[28] and fear a CRC examination.[37] They usually wait or do not respond to the symptoms. These actions increase the pre-hospital delay.[20,25,28]

In summary, empirical findings of the current study support the theoretical framework of Dracup et al.[20] which postulates that various factors influence pre-hospital delay, especially stimuli factors, such as CRC knowledge about the CRC screening method, cognitive illness perception, and healthcare-seeking behavior about self-medicating. Although emotional illness perception and appraisal of symptoms could not predict pre-hospital delay, there were statistically significant associations among Thai PW-CRC with pre-hospital delay.

Limitations

A limitation of this study might be the issue of how valid the researchers measured total time delays in diagnosis, especially pre-hospital delay. Since the pre-hospital delay is defined as "time from onset of the symptoms that PW-CRC perceived to the first visit to a physician", symptom interpretation of the study participants could be affected from other factors, such as culture, cognitive status, and memory recall ability. To amend this issue, the PI used the important date or major Thai holidays/festivals as the reference date, such as New Year Day, Songkran Day, Buddhist Holidays, Mother or Father Day as cues.[7] This technique helps PW-CRC recall the date of symptom onset that might occur during or close to any important holiday or festival.

Another limitation involves the healthcare-seeking behavior questionnaire. Only content validity and face validity were tested in this study but other validity such as construct validity using confirmatory factor analysis should be evaluated in the future.

Conclusions and Implications for Nursing Practice

Our study revealed that time to diagnosis, especially pre-hospital time in PW-CRC is still delayed. Knowledge about the CRC screening method jointly with healthcare-seeking behavior about self-medicating, illness perception including consequence of disease and symptoms, and reoccurring symptoms significantly predict pre-hospital delay.

Tailored nursing and medical interventions promoting knowledge, and positive illness perceptions in PW-CRC or high-risk groups of people, such as coherence, are needed. Also, interventions modifying negative illness perceptions, such as timeline/cyclical, would be helpful for these people. Future research should test interventions improving these factors through the experimental study.

Acknowledgement

We would like to thank all participants in this study and Chulalongkorn University, Graduate School for the scholarship "Chulalongkorn University Graduate Scholarship to Commemorate the 72nd Anniversary of His Majesty King Bhumibol Adulyadej" and "CU Graduate School Thesis Grant."

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ปัจจัยทำนายความล่าช้าในระยะเวลาก่อนมาโรงพยาบาลของบุคคลที่เป็นมะเร็งลำไส้ใหญ่และทวารหนัก

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บทคัดย่อ: มะเร็งลำไส้ใหญ่และทวารหนักเป็นมะเร็งที่พบได้บ่อยในคนไทย ความล่าช้าในการมาตรวจวินิจฉัยนำไปสู่การพยากรณ์โรคและการรอดชีพลดลง ความล่าช้าในการมาตรวจวินิจฉัยอย่างหนึ่งคือความล่าช้าในระยะเวลาก่อนมาโรงพยาบาล การศึกษาในครั้งนี้มีวัตถุประสงค์เพื่อศึกษาความล่าช้าในการมาตรวจวินิจฉัยทั้งระยะเวลาก่อนมาโรงพยาบาลและระยะเวลาในโรงพยาบาล กลุ่มตัวอย่างคือบุคคลที่เป็นมะเร็งลำไส้ใหญ่และทวารหนักจำนวน 240 รายจากโรงพยาบาลระดับตติยภูมิ 3 แห่งในประเทศไทย เก็บข้อมูลโดยแบบสอบถามข้อมูลส่วนบุคคล แบบสอบถามความรู้เกี่ยวกับมะเร็งลำไส้ใหญ่และทวารหนัก แบบสอบถามการรับรู้ความเจ็บป่วย แบบสอบถามพฤติกรรมแสวงหาบริการทางสุขภาพ และแบบสอบถามการรับรู้ความรุนแรงของอาการที่เป็นสัญญาณเตือนของมะเร็งลำไส้ใหญ่และทวารหนัก วิเคราะห์ข้อมูลโดยสถิติพรรณนา สหสัมพันธ์ของเพียร์สันและสเปียร์แมน และการถดถอยเชิงพหุคูณ

ผลการศึกษาพบว่าความล่าช้าในการมาตรวจวินิจฉัยอยู่ระหว่าง 4 ถึง 656 วัน ความล่าช้าในระยะเวลาก่อนมาโรงพยาบาลคือ 1 ถึง 632 วัน และความล่าช้าของระยะเวลาในโรงพยาบาลคือ 2 ถึง 315 วัน ค่ามัธยฐานคือ 87.50 วัน 32 วัน และ 28.50 วัน ตามลำดับ ความรู้เกี่ยวกับวิธีตรวจคัดกรองมะเร็งลำไส้ใหญ่และทวารหนักเป็นตัวทำนายที่ดีที่สุด และยังร่วมกับพฤติกรรมแสวงหาบริการทางสุขภาพด้านการซื้อยากินเอง การรับรู้ความเจ็บป่วยด้านการรับรู้ผลกระทบของอาการและการรับรู้วงจรการเปลี่ยนแปลงของอาการ ในการทำนายและอธิบายความแปรปรวนของความล่าช้าในระยะเวลาก่อนมาโรงพยาบาลได้ร้อยละ 48.70

กิจกรรมการพยาบาลเพื่อช่วยลดความล่าช้าในระยะเวลาก่อนมาโรงพยาบาลควรมีการส่งเสริมความรู้เกี่ยวกับโรค การรับรู้ความเจ็บป่วยและพฤติกรรมแสวงหาบริการทางสุขภาพที่เหมาะสม กิจกรรมเหล่านี้ควรได้รับการทดสอบประสิทธิภาพด้วยการศึกษาวิจัยเชิงทดลองต่อไป

Pacific Rim Int J Nurs Res 2022; 26(3) 446-460

คำสำคัญ: มะเร็งลำไส้ใหญ่และทวารหนัก พฤติกรรมแสวงหาบริการสุขภาพ การรับรู้ความเจ็บป่วย ความรู้ ความล่าช้าในระยะเวลาก่อนมาโรงพยาบาล ความล่าช้าในการมาตรวจวินิจฉัย

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