

## RESEARCH ARTICLE

# Colorectal Cancer Concealment Predicts a Poor Survival: A Retrospective Study

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### Abstract

**Objectives:** Understanding the situation of cancer awareness which doctors give to patients might lead to prognostic prediction in cases of colorectal cancer (CRC). **Methods:** Subsets of 10,779 CRC patients were used to screen the risk factors from the Cancer Registry in Pudong New Area in cancer awareness, age, TNM stage, and gender. Survival of the patients was calculated by the Kaplan-Meier method and assessed by Cox regression analysis. The views of cancer awareness in doctors and patients were surveyed by telephone or household. **Results:** After a median observation time of 1,616 days (ranging from 0 to 4,083 days) of 10,779 available patients, 2,596 of the 4,561 patients with cancer awareness survived, whereas 2,258 of the 5,469 patients without cancer awareness and 406 of the 749 patients without information on cancer awareness died of the disease. All-cause and cancer-specific survival were poorer for the patients without cancer awareness than those with ( $P < 0.001$  for each, log-rank test). Cox multivariate regression analysis showed that cancer concealment cases had significantly lower cancer-specific survival (hazard ratio (HR) = 1.299; 95 % confidence interval (CI): 1.200-1.407) and all-cause survival (HR = 1.324; 95 % CI: 1.227-1.428). Furthermore, attitudes of cancer awareness between doctors and patients were significantly different ( $P < 0.001$ ). **Conclusion:** Cancer concealment, not only late-stage tumor and age, is associated with a poor survival of CRC patients.

**Keywords:** Colorectal cancer - awareness - risk factors - survival

*Asian Pac J Cancer Prev*, 14 (7), 4157-4160

### Introduction

Colorectal cancer is the third most commonly diagnosed tumor type in males and the second in females in the world (Jemal et al., 2011). The incidence rate is significantly increasing in a number of countries within Eastern Asia, which were historically at low risk but now most likely the result of increases by westernized lifestyle (Center et al., 2009a; Center et al., 2009b). And it has a five-year relative survival of approximately 60 % in the world (DeSantis et al., 2011; Jemal et al., 2011).

Previous studies have shown that modifiable lifestyle-related factors, including low levels of physical activity and obesity, are associated with survival after diagnosis in CRC patients (Kuiper et al., 2012). The few studies that have assessed the association between psychological burden and CRC survival suggest that patients who obtain to the information of suffering from CRC after diagnosis experience more favorable survival than those who do not (Ceilleachair et al., 2012; Hung et al., 2013). However, most studies evaluating the association between cancer awareness and CRC outcomes have focused on CRC

screening and post-diagnostic physical activity (Ballard-Barbash et al., 2012; Ketabi et al., 2012; Koo et al., 2012; Kuiper et al., 2012; Meyerhardt et al., 2006b; Meyerhardt et al., 2009; Papanikolaou et al., 2012). Results of such analyses could reflect reverse causality if patients with a more favorable prognosis to begin with are better able to participate in cancer awareness or, conversely, people with poor underlying health or a poor prognosis are unable to get the suffering information of themselves.

Some experts have shown that cancer concealment will adversely affect the care of cancer patients, and risk of tumor metastasis is increasing (Bennett et al., 2013; Fedor et al., 2013). Some experts have indicated that recreational physical activity after CRC diagnosis is associated with more favorable survival (Ballard-Barbash et al., 2012; Kuiper et al., 2012). In according to that, we get a hypothesis that there is a relationship between cancer awareness, age, TNM stage, gender, and poor prognosis of patients with CRC. Baseline and follow-up questionnaire information were used to evaluate the associations of post-diagnostic cancer awareness with colorectal cancer-specific and all-cause mortality in CRC patients.

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## Materials and Methods

### Study Participants

As of December 2011, the registered number of cancer patients up to 110 000 in Pudong New Area, the largest district in Shanghai and the forerunner of China's urbanization and new rural construction process, has undergone tremendous changes in the past 20 years. A total of 10 779 CRC patients were enrolled at all of the hospitals who have tumor diagnosis certificates and community hospitals which are responsible for the follow-up between June 2002 and December 2011. The mean patient age was 67.0 years old (range, 12-99 years old). According to TNM staging, 806 patients (7.48%) had stage I disease, 2 279 patients (21.14 %) had stage II disease, 1 884 patients (17.48 %) had stage III disease, 1 372 patients (12.73 %) had stage IV disease, and 4 438 patients (41.17 %) were unknown. All patients were of ethnic Chinese origin. The study protocol conformed to the ethical guidelines of the 1975 Declaration of Helsinki and was approved by our institutional review board. All patients who were recruited for the study provided informed consent by themselves or their families and followed up by community doctors every 6 months.

### Data collection

Information on demographic factors, diagnosis, and survival of CRC was collected through the Shanghai Cancer Registry completed at the time of study enrollment. Information on survival was collected through vital statistics section in center for disease control and prevention of Pudong New Area. Certified staff checked the information of cancer awareness after diagnosis and the views, whether approval of patients with CRC should be concealed or not, of doctors from hospitals or community health centers and cancer patients at in-person telephone or household surveys.

### Statistic analysis

All-cause survival and colorectal cancer-specific survival were analyzed by Kaplan–Meier method, respectively. The log-rank test allowed for comparison of the curves. Cox regression analysis allowed for multivariate analysis of survival risk factors. Candidate variables, such as cancer awareness, age, TNM, and gender, were explored using  $\chi^2$  tests. All statistical analyses were two-sided and done using the Statistical Package for the Social Sciences software version 16.0 (SPSS, Inc., Chicago, IL). Statistical significance was set at  $P < 0.05$ .

## Results

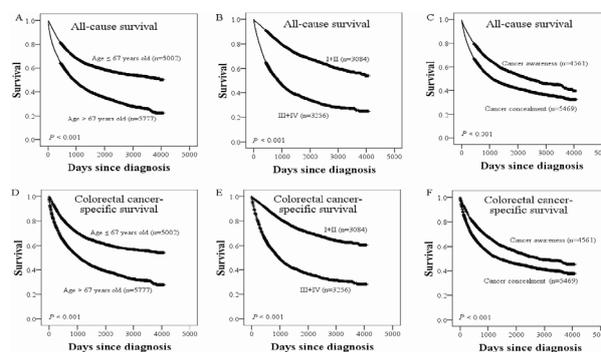
### Baseline characteristics

Of all 10 779 patients, 749 patients were excluded because their information of diagnostic cancer awareness were not quite clear, and 10 030 patients with CRC were eligible for analyses of cancer awareness. Of those, 5 175 (51.60 %) died during a median study follow-up of 1616 days (range 0–4083 days); of those who died, 4 696 (90.74 %) died due to CRC. Baseline characteristics

**Table 1. Clinical Characteristics and Cancer Awareness Status of the 10 779 Colorectal Cancer Patients Involved in the Study**

	Cancer awareness (n)	Cancer concealment (n)	Unknown (n)	P value
Case number	4561	5469	749	
Age				
≤ 67	2585	2124	293	<0.001
> 67	1976	3345	456	
Sex				
Male	2594	2752	403	<0.001
Female	1967	2717	346	
TNM stage				
I+II	1549	1400	135	<0.001
III+IV	1489	1588	179	
Unknown	1523	2481	435	

TNM, tumor/ lymph nodes/ metastasis



**Figure 1. All-cause and Cancer-specific Survival of Patients with Colorectal Cancer at Early or Late Stage, at Younger or Older Age and with or Without Cancer Awareness.** A, D, the patients at younger age vs. those at older age; B, E, the patients at stages I+II vs. those at stages III+IV; C, F, the patients with cancer awareness vs. those with cancer concealment

across diagnostic cancer awareness are shown in Table 1. There were significant differences in age ( $\leq 67$  years vs  $> 67$  years), sex, or TNM stage (stages I and II vs stages III and IV) between the 10 030 patients with CRC who had or had not been informed.

### Prognosis of the patients with or without cancer awareness

Kaplan-Meier curves were constructed first to analyze the all-cause and cancer-specific survival of the 10 779 patients, the older age group was significantly predicted poor survival ( $P < 0.001$  for each; log-rank test, Figure 1 A,C). And of the 6026 patients whose TNM stage were clear, late stage was significantly predicted poor survival ( $P < 0.001$  for each; log-rank test, Figure 1 B,E). In the 10 030 patients whose status of cancer awareness were clear, cancer concealment was associated significantly with poor survival ( $P < 0.001$  for each; log-rank test, Figure 1 C,F). To determine which factors were associated independently with the prognosis of patients with CRC, we used Cox multivariate regression analysis to estimate 6026 patients for the independent prognostic value of sex, age, TNM stage, and cancer awareness status. We observed that old age, cancer concealment and late-stage tumors were independent predictors of all-cause and cancer-specific survival, whereas sex was not, as indicated in Table 2.

**Table 2. Cox Multivariate Analysis on Risk Variables of Colorectal Cancer-specific Mortality and All-cause Mortality**

	Colorectal cancer-specific mortality		All-cause mortality	
	HR (95% CI)	P value	HR (95% CI)	P value
Age (>67 vs. ≤67, yrs)	1.552 (1.433-1.681)	<0.001	1.611 (1.493-1.738)	<0.001
Sex (male vs. female)	1.078 (0.997-1.165)	0.059	1.067 (0.991-1.149)	0.086
Stage (III+IV vs. I+II)	3.040 (2.795-3.307)	<0.001	2.887 (2.666-3.126)	<0.001
Cancer awareness(- vs. +)	1.299 (1.200-1.407)	<0.001	1.324 (1.227-1.428)	<0.001

“+”, cancer awareness; “-”, cancer concealment; HR, hazard ratio; CI, confidence interval

**Table 3. The View of Patients with Colorectal Cancer Should Be Concealed in Doctors and Patients**

	Doctors in hospitals	Community doctors	Patients	Total
Approval	5	8	8	21
Disapproval	4	7	60	71
Depending on the clinical situation	15	20	22	57

Doctors vs patients:  $\chi^2=32.949$ ;  $P < 0.001$

#### The attitude to cancer awareness of doctors and patients

The survey in hospital and community doctors or patients with CRC demonstrated that there are differences in their views of cancer awareness, and the value was significantly higher in patients than in doctors with cancer awareness ( $P < 0.001$ , Table 3).

## Discussion

In common sense, late stage and agedness were related to a poor survival in most tumors (Howlader et al., 2010; Li et al., 2011; Roth et al., 2012), even if few studies reported that there is no prognostic effect of age at diagnosis (Vostakolaei et al., 2012), or the youngest patients were at the highest risk of all cause and cancer-specific death (Lin et al., 2009). But the relationship between awareness and survival for cancer patients is a highly controversial topic and it is different in different cultures (Maringe et al., 2013). It is generally believed that ‘right to know should obey right to exist’, namely considering the survival pressure of patients, we should hide the actual situation of patients to reduce the psychological burden and to protect them to keep a happy life (Chao et al., 2004; Mai et al., 2007). But now, we found that cancer patients’ survival right and informed right are unified inseparable as a whole, no matter from the analysis of single factor or multiple factors, the survival not only in all-cause but also in cancer-specific of tumor patients informed groups are far superior to those without informed, which suggests that cancer patients maybe positive to change their lifestyle and fight against cancer after knowledge of suffering from cancer, and thus to get a longer life expectancy (Meyerhardt et al., 2006a; Campbell et al., 2010; Anderson et al., 2013).

From the result of the survey of whether approval cancer awareness or not, we found that there is a cautious attitude for it in doctors and there is a positive demand in patients with CRC. To avoid medical risks and reduce reaction, doctors normally have to follow the desire of patients’ family to be cancer concealment, leading to patients who can’t be effective rehabilitation (Wang et al.,

2011; Wang et al., 2013). But according to this research, its conclusion might be a benefit for doctors and patients, even the patient’s family who have to change their habitual cognition.

Limitations of this study should be mentioned. Data on cancer treatment were not available. It is unlikely that the received treatment would be different according to diagnostic cancer awareness; however, it is plausible that response to treatment of nurses and patients’ family could be influenced by these exposures. Furthermore, the accurate information of outcomes, such as recurrence and metastasis, were difficult to be obtained, so the disease-free survival wasn’t to be calculated. However, we observed marked difference in the association between cancer awareness and all-cause mortality when analyses were stratified at diagnosis, a strong predictor of treatment course. Lastly, identification of the status of patients who obtained information of their disease during the course but hide themselves would lead to reporting bias, but it is only harmless for underestimating the benefit of cancer awareness.

There are also several important strengths of the present analysis, including the large overall sample size, organized tracking for a long period of time, and authoritative survival outcome events. The retrospective design of this study has the advantage of reducing the likelihood of selection bias as exposures were assessed after diagnosis, and also has the advantage of enrolling patients simultaneous with the diagnosis such that inclusion in the study population is not influenced by the duration of survival after diagnosis. To our review, this study is one of the few studies investigating the relationship between cancer awareness, and colorectal cancer-specific mortality and all-cause mortality.

In conclusion, these findings, along with previous studies, suggest that cancer awareness after CRC diagnosis may enhance survival, as TNM stages indicated. These data support the need for clinical treatment and family care to elucidate the effect of cancer awareness on survival in patients with CRC.

## Acknowledgements

This study was supported by a grant from the Fund of Key Discipline Construction in Pudong New Area Health System (No. PWZxk2010-009). The author(s) declare that they have no competing interests.

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