The choice of medical facility and associated factors among Chinese advanced colorectal cancer patients: a cross-sectional multi-center study

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Background: Colorectal cancer (CRC) poses a significant public health burden worldwide. The investigation of the choice of medical facility among CRC patients is helpful for understanding access to health services and improving quality of oncology services to optimize health outcomes. However, there are limited studies on the topic. The objective of this study was to investigate the choice of medical facility and its associated factors among advanced CRC patients.

Methods: This cross-sectional multi-center study included a total of 4,589 individuals with advanced CRC from 19 hospitals in 7 geographic regions in China. Participants were recruited by multi-stage stratified sampling. In the first stage, two cities in each geographic region were selected through simple random

sampling. In the second stage, one tertiary cancer hospital and/or one general hospital were selected in each city. Data on medical experience and demographics were collected via a questionnaire during face-to-face interviews. Explanatory variables were selected based on the Andersen behavioral model. Multinomial logistic regression analyses were performed to explore the factors associated with the level of medical facility for the first treatment.

Results: Hospitals at the prefecture level were the most common medical facility sought by advanced CRC patients for initial medical care (44.9%), the first definite diagnosis (46.3%), the first treatment (39.5%), and regular follow-up (38.9%). However, the first priority was changed to hospitals at the national level for the second treatment (38.0%) and after recurrence and metastasis (45.9%). Female {odds ratios (ORs) ranged from 1.31 [95% confidence interval (CI): 1.01–1.71] to 1.41 (95% CI: 1.07–1.87)} and relatively well-educated individuals [ORs ranged from 1.74 (95% CI: 1.20–2.53) to 7.26 (95% CI: 4.18–12.60)] preferred to seek higher-level health facilities. Individuals with metastatic CRC at diagnosis were more likely to visit hospitals in provincial capitals versus hospitals at the county level (OR =1.68, 95% CI: 1.27–2.22). Individuals with "good" health-related quality of life (HRQOL) (OR =0.63, 95% CI: 0.49–0.81) were less likely to seek hospitals at the prefecture level compared with hospitals at the county level.

Conclusions: There is a need to improve the oncology services for CRC patients, including the optimization of referral reform policy and the promotion of quality of primary healthcare service. The results may provide evidence to fill the policy-implementation gap and potentially contribute to the improvement of the efficiency of the healthcare system.

Keywords: Colorectal cancer (CRC); healthcare seeking; medical facility; associated factors

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Introduction

Colorectal cancer (CRC), one of the most common malignancies worldwide, was responsible for 1,931,590 new cases and 935,173 deaths in 2020 (1). In China, according to the latest Chinese Cancer Registration Report in 2019, new cases of CRC accounted for nearly 10% of all cancers, with CRC deaths accounting for 8% of all cancer deaths (2), posing a serious threat to public health. For decades, China has implemented a series of programs to improve CRC screening, early diagnosis, and treatment, leading to a significant increase in CRC survival (3). However, the 5-year survival rate is still only about 20% for advanced CRC patients (4), and the majority of CRC patients have advanced or metastatic cancer at their first diagnosis (5,6), suggesting that there are other barriers to care for CRC patients, especially for those at the advanced stage. Of note, it has been reported that disparities in access to diagnosis and treatment services may contribute to marked differences in CRC survival between countries or regions (7,8). The investigation of healthcare-seeking behaviors among CRC patients is critical for understanding access to health services, identifying service gaps, and improving quality of oncology services to reduce health risks caused by inadequate services (9). It can also help policymakers and hospital administrators to understand patterns and driving factors underlying patients' healthcare-seeking behaviors, and thus to develop targeted strategies to alleviate the burden of CRC (10).

Healthcare-seeking behavior, referring to the actions taken by individuals perceiving their illness to obtain an adequate remedy (11), involves several decision-making processes such as whether and from whom to seek healthcare, as well as what kind of healthcare to seek (10). Previous studies on healthcare-seeking behaviors among CRC patients focused on delays in presentation, diagnosis, and treatment, and showed that factors such as gender, education, economic status, and awareness of the disease, among others, could affect delays in healthcare services (12-16). Beyond that, examining the choice of medical facility among CRC patients and its associated factors is also important for understanding patients' needs for health services. This will help to identify potential gaps in service

provision (17), and take measures to improve quality of oncology services for optimizing health outcomes (18). However, research on the choice of medical facility among CRC patients and its associated factors is very limited.

Here, we aimed to investigate the choice of medical facility and its associated factors among advanced CRC patients. Many factors may affect the utilization of health services. A behavioral model, initially developed by Andersen in the 1970s, has been commonly used to identify factors involved in healthcare utilization (19). This model suggests that the determinants of healthcare utilization can be classified into predisposing characteristics, enabling resources, and need factors. Predisposing factors, namely individual characteristics, include demographic, socio-structural, and attitudinal-belief variables (20). Enabling factors refer to the variation in availability of resources which may facilitate or impede individuals' healthcare use (21). Need factors encompass the perceived and assessed needs for health services (22). Based on the conceptual framework, this study collected information on the medical experience of 4,589 individuals with advanced CRC to investigate their choice of medical facility and associated factors, thus providing clues for the improvement of quality of oncology services in China. We present the following article in accordance with the STROBE reporting checklist (available at https://atm.amegroups.com/article/view/10.21037/atm-22-1020/rc).

Methods

Study design and population

Data were obtained from the largest CRC survey conducted in China from March 2020 to March 2021. The cross-sectional multi-center study included 19 hospitals in 7 geographic regions of mainland China. Hospital selection was conducted as follows. According to the definition of traditional administrative districts, China is divided into seven geographic regions: Northwest, Northeast, North, Central, Southern, Southwest and Eastern. Each region shows different CRC burden levels (23). First, two cities in each geographic region were selected through simple random sampling. Second, one tertiary cancer hospital and/or one general hospital, which can provide health services including diagnosis, surgery, chemotherapy, radiotherapy, and regular follow-up care for CRC patients, and where patients come from multiple parts of the region, were selected in each city. As a result, nineteen tertiary hospitals inclusive of ten cancer hospitals and nine general hospitals, were involved in this study.

Patients from the selected hospitals were enrolled according to the following criteria: (I) diagnosis of stage III or IV CRC; (II) aged ≥18 years old. Patients who could not complete the questionnaire due to physical, cognitive, or verbal disorders were excluded. Sample size was calculated based on the number of advanced CRC patients in China, which was estimated to be 400,000 cases (24,25). To ensure geographical representativeness of the national survey, about 1% of the cases were taken into consideration, and taking into account the non-response rate of 10%, over 4,445 patients needed to be enrolled. In fact, a total of 4,589 individuals with advanced CRC were recruited in the current study. The study was conducted in accordance with the Declaration of Helsinki (as revised in 2013). This research was approved by the review board of Henan Cancer Hospital (No. 2019273), and the study was approved by all institutional review boards of the participating hospitals. All participants provided written informed consent.

Study procedures

In the first phase, workshops with researchers from all the centers were conducted for preparation, including questionnaire design, obtainment of prior agreement of the study launch, development of the implementation manual and staff training. Next, a pilot survey including 50 CRC patients was performed in Henan Cancer Hospital and The First Affiliated Hospital of Baotou Medical College to verify operating procedures and questionnaires. The formal survey was launched after ethical approval. It would take approximately 20 minutes to complete the questionnaire, and participants could get 30 yuan for their contribution after filling out the questionnaire. In addition, the survey was carried out by trained interviewers, and principles of good research practice was strictly adhered to during data collection.

Data collection

Socio-demographics, health-related quality of life (HRQOL) prior to the first treatment, and medical experience-related variables were collected as part of the protocol of the survey via a questionnaire during face-to-face interviews. Socio-demographics covered self-reported information on age, gender, occupation, education, marital status, annual household income of patients, and medical insurance. In addition, a semi-structured questionnaire was

designed to collect data on patients' medical experience in the diagnosis and treatment phases: the number of visited hospitals from initial medical care to the survey date, reasons for seeking initial medical care, the choice of medical facility in all the diagnosis and treatment phases, the choice of hospital department for initial medical care and the first definite diagnosis, and the choice and reasons for changing hospitals during the period from definite diagnosis to the first treatment, from the first treatment to the second treatment, and after recurrence and metastasis. Besides, clinical information such as metastasis status at the first definite diagnosis and the type of CRC were obtained though medical records.

Selection and definition of variables in logistic regression analyses

In the study, we defined the outcome variable as the level of medical facility visited by advanced CRC patients for their first treatment. The outcome variable was coded into 4 categories: hospitals at the national level, hospitals in provincial capital, hospitals at the prefecture level, and hospitals at the county level. In the analyses, we always used "hospitals at the county level" as a reference level.

We selected explanatory variables guided by the Andersen model (19), which has been commonly used to identify factors influencing the utilization of health services. In the study, variables considered as predisposing characteristics were age (≤40, 41–60, >60), gender (male, female), education (primary school or below, middle school, high school, college and above), occupation of patients or their families (non-healthcare related, healthcare related), and marital status (not married/divorced/widowed, married). Variables related to enabling resources included medical insurance (none, public, private) and annual household income of patients (<50,000 CNY, 50,000–100,000 CNY, >100,000 CNY). For need factors, metastasis status at the first definite diagnosis (no, yes), the type of cancer (colon, rectum, both), and HRQOL prior to the first treatment were selected. The traditional Chinese Functional Assessment of Cancer Therapy-Colorectal (FACT-C, version 4) was used to measure HRQOL. The scale includes 5 function subscales (physical well-being, social/family well-being, emotional well-being, functional well-being, and CRC subscale). Each item was valued on a 5-point Likert-type scale (0–4). The total scores were calculated (ranged from 0 to 136), and then were classified as "poor" (total score ≤100) and "good" (total score >100) (26).

Statistical analysis

Data were presented as mean ± standard deviation (SD) for continuous variables and percentages (%) for categorical variables. In the bivariate analyses, explanatory variables were selected based on the Andersen model, and multinomial logistic regression models were performed to analyze associations between the level of medical facility attended for the first treatment and potential factors. Odds ratios (ORs) as well as 95% confidence intervals (CIs) could be consequently calculated. Variables with an association of P value <0.1 were subsequently included in multivariate analyses among patients with complete information. All statistical analyses were performed using R v3.6.1 with a two-tailed P value of <0.05 being considered statistically significant.

Results

Participants' characteristics

A total of 4,589 participants comprised of 2,730 males and 1,859 females were included in the survey. Demographic and health characteristics of the participants are summarized in *Table 1*. Only 270 (5.9%) individuals were aged 40 years or below, while 1,979 (43.1%) were in the age group of 41–60 years, and 2,340 (51.0%) were aged above 60 years. Most individuals (94.1%) were married, and only 569 (12.4%) individuals or their families had healthcare-related occupations. There were similar results in terms of educational attainment, with 32.2% completing middle school, followed by primary school or below (29.0%), high school (22.8%), and college and above (16.0%). More than half (57.4%) of the individuals had an annual household income of less than 50,000 CNY, while 28.3% were in the income group of 50,000-100,000 CNY, and 14.3% had a high household income (>100,000 CNY). For insurance type, 51 (1.1%) individuals had no medical insurance, while 220 (4.8%) had private insurance, and others (94.1%) only had public insurance. Of note, 1,709 (37.5%) individuals had developed metastatic cancer at the first definite diagnosis. In addition, 50.9% of individuals reported "poor" HRQOL prior to the first treatment, with 49.1% reporting "good".

The choice of medical facility among advanced CRC patients

The median number of hospitals visited by study individuals was 2.00 (range, 1.00–7.00; mean 1.94). With regard to the

Table 1 Socio-demographic and health characteristics of individuals with advanced colorectal cancer

Variables	Frequency	Proportion (%)
Age (years)		
≤40	270	5.9
41–60	1,979	43.1
>60	2,340	51.0
Gender		
Male	2,730	59.5
Female	1,859	40.5
Marital status		
Not married/divorced/widowed	270	5.9
Married	4,318	94.1
Education		
Primary school or below	1,330	29.0
Middle school	1,478	32.2
High school	1,044	22.8
College and above	734	16.0
Occupation		
Non-healthcare related	4,017	87.6
Healthcare related	569	12.4
Annual household income of patients (CNY)		
<50,000	2,624	57.4
50,000–100,000	1,293	28.3
>100,000	656	14.3
Medical insurance		
None	51	1.1
Public	4,305	94.1
Private	220	4.8
Metastasis at first definite diagnosis		
No	2,854	62.5
Yes	1,709	37.5
CRC location		
Colon	2,063	45.0
Rectum	2,470	53.8
Other	55	1.2
HRQOL prior to the first treatment		
Poor	2,311	50.9
Good	2,230	49.1

CNY, Chinese Yuan; CRC, colorectal cancer; HRQOL, health-related quality of life.

reasons for initial care, 4,015 (88.0%) individuals found suspected symptoms (e.g., hematochezia, severe diarrhea, and abdominal pain) themselves, while 269 (5.9%) and 279 (6.1%) found suspected symptoms during health examination and treatment for other diseases, respectively.

The choice of medical facility of advanced CRC patients are presented in *Table 2*. Of the 4 levels of medical facilities, individuals preferred to visit hospitals at the prefecture level in phases including initial medical care (44.9%), the first definite diagnosis (46.3%), the first treatment (39.5%), and regular follow-up (38.9%). Intriguingly, individuals were more likely to choose hospitals at the national level for the second treatment (38.0%) and after recurrence and metastasis (45.9%). Furthermore, the most common hospital department sought by CRC patients was the department of gastrointestinal surgery for both initial medical care (55.8%) and the first definite diagnosis (60.3%).

The percentages of individuals changing hospitals were 31.8%, 28.9%, and 22.1% during the period from definite diagnosis to the first treatment, from the first treatment to the second treatment, and after recurrence and metastasis, respectively. Among those who visited multiple hospitals, the majority of individuals (57.3–62.3%) changed hospitals from their own willingness during the medical care seeking process, while some individuals followed their offspring's advice (23.9–29.0%) or the doctor's advice (10.2–12.7%), and only a very small proportion (0.7–2.4%) changed hospitals due to a lack of therapeutic drugs.

Factors associated with the choice of medical facility for the first treatment

We next performed multinomial logistic regression models to identify factors associated with the choice of medical facility for the first treatment. The results of the bivariate analysis are reported in *Table 3*. Several factors including age, gender, educational attainment, occupation, annual household income of patients, medical insurance, metastasis at the first definite diagnosis, and HRQOL prior to the first treatment were significantly associated with the level of facility ($P<0.1$).

Subsequently, we conducted a multivariate analysis by incorporating these predictive factors into multinomial logistic regression models. As shown in *Table 4*, the results demonstrated that gender was significantly associated with the level of medical facility, ranging from 1.31 to 1.41 times greater odds for females compared with males. Individuals who completed high school or college and

Table 2 The choice of medical facility and department among individuals with advanced colorectal cancer

Variables	Initial medical care	The first definite diagnosis	The first treatment	The second treatment	After recurrence and metastasis	Regular follow-up
Hospital level, n (%)						
Hospitals at the national level	634 (13.8)	851 (18.7)	1,458 (32.3)	1,089 (38.0)	592 (45.9)	684 (34.2)
Hospitals in provincial capital	662 (14.4)	814 (17.9)	986 (21.9)	610 (21.3)	275 (21.3)	393 (19.7)
Hospitals at the prefecture level	2,060 (44.9)	2,106 (46.3)	1,780 (39.5)	1,042 (36.3)	378 (29.3)	778 (38.9)
Hospitals at the county level	1,234 (26.9)	781 (17.2)	286 (6.3)	126 (4.4)	45 (3.5)	144 (7.2)
Hospital department, n (%)						
Dept. of gastrointestinal surgery	2,466 (55.8)	2,454 (60.3)				
Dept. of gastroenterology	781 (17.7)	524 (12.9)				
Dept. of general surgery	539 (12.2)	531 (13.0)				
Dept. of medical oncology	189 (4.3)	238 (5.8)				
Dept. of hepatobiliary surgery	46 (1.0)	44 (1.1)				
Dept. of radiotherapy	22 (0.5)	25 (0.6)				
Others	374 (8.5)	254 (6.2)				
Changing hospitals, n (%)						
Yes			981 (31.8)	617 (28.9)	218 (22.1)	
No			2,102 (68.2)	1,519 (71.1)	769 (77.9)	
Reasons for changing hospitals, n (%)						
The doctor's advice			109 (10.2)	84 (12.7)	28 (11.3)	
The patient's own willingness			661 (61.6)	411 (62.3)	142 (57.3)	
The offspring's advice			295 (27.5)	158 (23.9)	72 (29.0)	
Lack of therapeutic drugs			8 (0.7)	7 (1.1)	6 (2.4)	

Dept., department.

above, as compared with primary education or below, were more likely to visit hospitals at a higher level [ORs ranged from 1.74 (95% CI: 1.20–2.53) to 7.26 (95% CI: 4.18–12.60)], while individuals who completed middle school only preferred to visit hospitals at the national level (OR =1.81, 95% CI: 1.33–2.47). Individuals with metastatic cancer at the first definite diagnosis preferred to visit hospitals in provincial capitals (OR =1.68, 95% CI: 1.27–2.22). Individuals with "good" HRQOL prior to the first treatment were less likely to visit hospitals at the prefecture level compared with hospitals at the county level (OR =0.63, 95% CI: 0.49–0.81).

Discussion

In this study, we investigated the choice of medical facility in multiple medical processes among Chinese advanced CRC patients using data from a nationwide multi-center survey. To further explore potential factors affecting the choice of medical facility for the first treatment, multinomial logistic regression analyses were performed based on the Andersen model. Our findings offer important evidence on the drivers of utilization of healthcare services by CRC patients, which may contribute to the improvement of referral patterns and the construction of a well-structured healthcare system.

The choice of medical facility among individuals with advanced CRC varied in different medical processes in this study. For initial medical care, the first definite diagnosis, the first treatment, and regular follow-up, the most common facilities sought by CRC patients were hospitals at the prefecture level. However, the first priority was changed to hospitals at the national level for the second treatment

Table 3 Odds ratios (and 95% confidence intervals) from bivariate logistic regressions of the level of medical facility for the first treatment and explanatory variables

Variables	Hospital at the prefecture level		Hospital in provincial capital		Hospital at the national level	
	OR (95% CI)	P value	OR (95% CI)	P value	OR (95% CI)	P value
Age (years)						
≤40	Ref.		Ref.		Ref.	
41–60	1.12 (0.58–2.13)	0.740	0.63 (0.33–1.19)	0.155	0.63 (0.33–1.17)	0.145
> 60	1.20 (0.63–2.27)	0.579	0.45 (0.24–0.85)	0.014	0.46 (0.25–0.85)	0.013
Gender						
Male	Ref.		Ref.		Ref.	
Female	1.27 (0.98–1.65)	0.072	1.24 (0.95–1.63)	0.117	1.11 (0.85–1.45)	0.432
Marital status						
Not married/divorced/ widowed	Ref.		Ref.		Ref.	
Married	0.89 (0.51–1.55)	0.678	0.69 (0.39–1.23)	0.211	1.12 (0.63–1.98)	0.704
Education						
Primary school or below	Ref.		Ref.		Ref.	
Middle school	1.05 (0.78–1.40)	0.768	1.08 (0.79–1.49)	0.615	1.71 (1.26–2.32)	0.001
High school	1.34 (0.95–1.90)	0.098	1.66 (1.15–2.39)	0.007	2.17 (1.51–3.10)	<0.001
College and above	2.22 (1.28–3.84)	0.004	4.69 (2.69–8.17)	<0.001	6.87 (3.98–11.87)	<0.001
Occupation						
Non-healthcare related	Ref.		Ref.		Ref.	
Healthcare related	0.82 (0.56–1.21)	0.316	1.50 (1.02–2.22)	0.041	0.89 (0.60–1.32)	0.568
Annual household income of patients (CNY)						
<50,000	Ref.		Ref.		Ref.	
50,000–100,000	1.25 (0.93–1.68)	0.131	1.15 (0.84–1.57)	0.377	1.52 (1.13–2.05)	0.006
>100,000	1.09 (0.71–1.69)	0.685	1.52 (0.97–2.37)	0.067	2.88 (1.88–4.41)	<0.001
Medical insurance						
None	Ref.		Ref.		Ref.	
Public	2.80 (0.86–9.15)	0.089	0.79 (0.26–2.36)	0.668	0.93 (0.32–2.73)	0.892
Private	4.15 (0.98–17.67)	0.054	2.08 (0.52–8.26)	0.298	3.21 (0.83–12.38)	0.090
Metastasis at the first definite diagnosis						
No	Ref.		Ref.		Ref.	
Yes	0.94 (0.72–1.23)	0.672	1.72 (1.30–2.26)	<0.001	1.28 (0.98–1.67)	0.074
CRC location						
Colon	Ref.		Ref.		Ref.	
Rectum	1.06 (0.83–1.36)	0.642	1.06 (0.81–1.38)	0.676	1.18 (0.92–1.53)	0.200
Other	2.32 (0.30–17.76)	0.419	3.91 (0.51–30.17)	0.191	5.21 (0.70–38.81)	0.107
HRQOL prior to the first treatment						
Poor	Ref.		Ref.		Ref.	
Good	0.63 (0.49–0.81)	<0.001	1.07 (0.82–1.39)	0.642	1.11 (0.86–1.43)	0.431

CNY, Chinese Yuan; HRQOL, health-related quality of life; CRC, colorectal cancer; OR, odds ratio; CI, confidence interval; Ref., reference.

Table 4 Odds ratios (and 95% confidence intervals) from multivariate logistic regressions of the level of medical facility for the first treatment

Variables	Hospital at the prefecture level		Hospital in provincial capital		Hospital at the national level	
	OR (95% CI)	P value	OR (95% CI)	P value	OR (95% CI)	P value
Gender						
Male	Ref.		Ref.		Ref.	
Female	1.31 (1.01–1.71)	0.045	1.41 (1.07–1.87)	0.016	1.34 (1.02–1.76)	0.033
Education						
Primary school or below	Ref.		Ref.		Ref.	
Middle school	1.09 (0.81–1.46)	0.583	1.13 (0.82–1.56)	0.446	1.81 (1.33–2.47)	<0.001
High school	1.38 (0.97–1.96)	0.073	1.74 (1.20–2.53)	0.003	2.28 (1.59–3.28)	<0.001
College and above	2.39 (1.38–4.16)	0.002	4.79 (2.74–8.40)	<0.001	7.26 (4.18–12.60)	<0.001
Metastasis at the first definite diagnosis						
No	Ref.		Ref.		Ref.	
Yes	0.96 (0.73–1.25)	0.744	1.68 (1.27–2.22)	<0.001	1.24 (0.94–1.63)	0.123
HRQOL prior to the first treatment						
Poor	Ref.		Ref.		Ref.	
Good	0.63 (0.49-0.81)	<0.001	1.04 (0.80–1.36)	0.767	1.09 (0.84–1.42)	0.500

HRQOL, health-related quality of life; OR, odds ratio; CI, confidence interval; Ref., reference.

and after recurrence and metastasis. This may be because individuals with a relatively severe medical condition have an urgent need to seek a high-level healthcare facility, and hospitals at the national level are generally perceived to offer the best quality medical services. In regards to the choice of changing hospitals, most individuals did not change hospitals during the medical processes. Among those who changed hospitals, the majority took the action from their own willingness, followed by the offspring's advice or the doctor's advice. Only a very small proportion changed hospitals owing to a lack of therapeutic drugs. This is a reflection of the fairly good Essential Drug System, which facilitates the availability and quality of essential medicines.

Multivariate logistic regression analysis revealed that the level of medical facility sought by the CRC patients was significantly associated with gender, education, metastasis at the first definite diagnosis, and HRQOL prior to the first treatment. As a result, females were more likely to seek higher-level facilities versus hospitals at the county level. This was in line with previous studies where males exhibited poor healthcare-seeking behavior and healthcare utilization (27-30). The literature indicated that the healthcare-seeking behavior of males might be affected by the society and culture surrounding them, and in some cases, the concepts of masculinity could prevent males from seeking medical help (27). Another prominent factor strongly associated with the choice of medical facility was educational attainment. The results showed that well-educated individuals were more likely to visit higher-level health facilities compared with hospitals at the county level. This is probably because less educated individuals prefer to follow their doctor's advice, and thus are less likely to bypass the primary care facility (31,32). Besides, we also observed that individuals suffering from metastatic CRC at diagnosis were more likely to seek hospitals in provincial capitals for the first treatment compared with hospitals at the county level. This may be due to the fact that hospitals in provincial capitals are generally perceived to have good health resources and the ability to offer quality services. Simultaneously, the complicated referral mechanism may reduce the willingness of CRC patients to visit hospitals at the national level. Additionally, individuals with "good" HRQOL prior to the first treatment were more likely to seek hospitals at the county level rather than hospitals at the prefecture level.

The result may be attributed to the fact that compared with individuals with "poor" status, individuals with "good" HRQOL have a relatively less urgent need to seek higher level facilities. That is, they probably believe that hospitals at the county level meet their requirements for treatment.

Although data in this study was based on a nationwide multi-center survey and multivariate logistic regression analysis was performed to correct potential confounders, there are also several limitations. First, information on healthcare-seeking behaviors relied entirely on self-reporting, which might result in recall bias and the occurrence of under-reporting or over-reporting, and thus likely affected the reliability or validity of the results. Second, some potential factors which likely influence the choice of medical facility, such as distance from home to the medical facility and time to reach the facility, were not available. We will conduct further study to collect such information and adjust for more confounders to build strong support for the current results.

Overall, this study described the choice of medical facility among individuals with advanced CRC in different medical phases, and identified several factors associated with the choice of medical facility for the first treatment, such as gender, education, metastasis at the first definite diagnosis, and HRQOL prior to the first treatment. Our findings provide evidence to fill the policy-implementation gap and may contribute to the improvement of the efficiency of the healthcare system.

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Footnote

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Ethical Statement: The authors are accountable for all aspects of the work in ensuring that questions related to the accuracy or integrity of any part of the work are appropriately investigated and resolved. The study was conducted in accordance with the Declaration of Helsinki (as revised in 2013). This research was approved by the review board of Henan Cancer Hospital (No. 2019273), and the study was approved by all institutional review boards of the participating hospitals. All participants provided written informed consent.

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