Assessment of patients’ preferences for new anticancer drugs in China: a best–worst discrete choice experiment on three common cancer types

Zhe Feng, Jingyi Meng, Yanjun Sun, Tongling Xie, Wenzhang Lu, Guohua Wang, Jinsong Geng

ABSTRACT

Objectives Despite the advancement in anticancer drug therapies, cancer treatment decisions are often complex and preference-sensitive, making them well suited for studying shared decision-making (SDM). Our study aimed to assess preferences for new anticancer drugs among three common types of patients with cancer to inform SDM.

Design We identified five attributes of new anticancer drugs and used a Bayesian-efficient design to generate choice sets for a best–worst discrete choice experiment (BWDCE). The mixed logit regression model was applied to estimate patient-reported preferences for each attribute. The interaction model was used to investigate preference heterogeneity.

Setting The BWDCE was conducted in Jiangsu province and Hebei province in China.

Participants Patients aged 18 years or older, who had a definite diagnosis of lung cancer, breast cancer or colorectal cancer were recruited.

Results Data from 468 patients were available for analysis. On average, the most valued attribute was the improvement in health-related quality of life (HRQoL) (p<0.001). The low incidence of severe to life-threatening side effects, prolonged progression-free survival and the low incidence of mild to moderate side effects were also positive predictors of patients’ preferences (p<0.001). Out-of-pocket cost was a negative predictor of their preferences (p<0.001). According to subgroup analysis by type of cancer, the improvement in HRQoL remained the most valuable attribute. However, the relative importance of other attributes varied by type of cancer. Whether patients were newly diagnosed or previously diagnosed cancer cases played a dominant role in the preference heterogeneity within each subgroup.

Conclusions Our study can assist in the implementation of SDM by providing evidence on patients’ preferences for new anticancer drugs. Patients should be informed of the multiaspect values of new drugs and encouraged to make decisions reflecting their values.

INTRODUCTION

Cancer is a major global public health problem and a leading cause of death worldwide. It has also become a substantial challenge to the health of the Chinese people. In 2020, there were 4,568,754 new cancer cases and 3,002,899 cancer-related deaths in China, and cancer deaths accounted for approximately 24% of all-cause mortality. Meanwhile, the cancer spectrum in China is changing, with a rapid rise in the incidence and burden of lung, breast and colorectal cancer. Lung cancer is the most common cancer type and the leading cause of cancer death in China, and breast cancer has become the most common cancer type among women. The high burden of cancer requires effective actions to improve the quality of care.

In recent years, molecular targeted therapies and other innovative anticancer drugs offer hopes for patients with cancer. The accessibility of new anticancer drugs has improved significantly since the Chinese government expanded regulatory capacity and initiated a series of programmes to...
accelerate the development, review, approval and reim-
bursement of new drugs. Despite advances in ther-
apeutic strategies and drug availability, cancer treatment
involves uncertainties and risks, as well as high out-of-
pocket costs. Clinical decisions for both clinicians and
patients on new anticancer drugs are often stressful or
even conflicting. Studies with an improved design are
generated to support decision-making.

Shared decision-making (SDM) is part of a broader
concept of patient-centred care, identified by the Insti-
tute of Medicine as one of the key elements to achieve
high-quality healthcare. Engaging patients with cancer
in their treatment decisions has received increased
attention. Patients would benefit from clinicians’ efforts
to identify their preferences, encourage an active role
in decision-making, and tailor decisions to desired choices. Furthermore, patients who are more involved in
clinical decisions are more likely to experience satisfac-
tion with treatment strategies, which leads to better clinical outcomes. Currently, advances in new anticancer
drugs result in multiple therapeutic options. Therefore,
engagement in SDM is more meaningful than ever.
However, essential elements of the SDM process would
be unexperienced without assessing patients’ preferences.

Best–worst scaling (BWS) has been used as a tool
to elicit patients’ preferences for healthcare services,
including cancer treatment. There are three types of
BWS, which differ according to the complexity of the options under consideration: object case (case 1),
profile case (case 2) and multiprofile case (also known as best–worst discrete choice experiment, BWDCE
or case 3). Compared with the traditional DCE, the
BWDCE provides larger amounts of data and richer
information on respondents’ preferences among alter-
 natives. Moreover, the utility of a single level of an attribute in BWDCE acts as a benchmark and not the entire scenario, allowing participants to determine the impact of the attribute level.

There is an increasing focus on preference heteroge-
nity, as the preferences of respondents on average can
be of limited value and threaten the generalisability of study findings. Nevertheless, little is known about vari-
ations in preferences for new anticancer drugs among
patients with common types of cancer. Meanwhile, a few studies only involved attributes belonging to a specific domain of anticancer therapies or lacked the attributes of patient-reported outcomes. Consequently, clinicians would find difficulty in making clinical decisions based on fragmented evidence of patients’ preferences.

To address the evidence gap, we conducted a BWDCE
study to investigate patients’ preferences for new anti-
cancer drugs. A comparative analysis was performed to
identify variations in preferences among three common
types of patients with cancer (ie, lung cancer, breast cancer and colorectal cancer). Preference heterogeneity
was also observed within each type of patient with cancer.

Our findings will provide evidence to inform SDM in clinical practice.

METHODS
Identification of attributes and levels
We took a three-step approach to define the attributes and levels of new anticancer drugs. First, a literature review on value assessment frameworks for anticancer therapies was performed to identify potential domains of attributes. Details of the domains included in the frameworks are shown in online supplemental appendix 1. A literature review of attributes and levels regarding anticancer therapies in preference-based studies was also conducted to further determine the attributes. The attributes and levels in the included studies are shown in online supplemental appendix 2.

Second, since the universe of attributes was vast, we consulted five oncology experts to further determine the attributes. To define the levels of attributes regarding health benefits and side effects, we searched the widely used health technology assessment (HTA) databases established by the National Institute for Health and Care Excellence, and the Canadian Agency for Drugs and Technologies in Health. Then we identified HTA reports of new drugs to treat lung cancer, breast cancer and colorectal cancer. We found 68 reports that had been published before 4 December 2021, and extracted the outcome data. The new drugs in the included HTA reports consisted of targeted drugs, chemotherapy drugs and immunosuppressants. The out-of-pocket cost was derived mainly from prior studies on anticancer drugs in China.

Finally, a pilot survey was conducted to provide feedback on the acceptability and intelligibility of the ques-
tionnaire. Patient responses led to a more apprehensible statement of survey questions. The attributes and levels in our BWDCE are listed in table 1, with a detailed explana-
tion in online supplemental appendix 3.

In this study, we defined new anticancer drugs as drugs that have been marketed in China for the treatment of
cancer in the last 5 years. However, the new drugs have not yet been widely used in clinical practice. Therefore, patients who indicated the use of new anticancer drugs were still receiving traditional treatment options. Consid-
ering the homogeneity of outcome measures in clinical trials of anticancer drugs and the generalisability of our potential findings, we did not limit the categories of
drugs, for example, targeted therapy, chemotherapy and immunotherapy.

Experimental design and development of the questionnaire
A Bayesian-efficient design was applied to generate choice sets for the BWDCE. Since random combina-
tions of attributes and levels result in too many possible scenarios, we used maximising D-efficiency to simplify the scenario settings. Our study employed Ngene V.1.2 soft-
ware (Choice-Metrics, Sydney, Australia) to design choice
sets, which consisted of 24 settings. We used blocking techniques to evenly distribute 24 scenarios into 4 blocks, each containing 6 choice sets, thus reducing the cognitive burden of the respondents. An example of the questionnaire is shown in online supplemental appendix 4.

The questionnaire consisted of three parts. The first part included the demographic characteristics of the patients and their attitudes towards SDM. Patients responded to two closed-ended questions that included ‘I am willing to actively participate in the SDM of anticancer treatment’ and ‘I am willing to know the value of new anticancer drugs with the help of decision-aids that provide scientific evidence.’ A 5-point Likert scale, ranging from 1 (strongly disagree) to 5 (strongly agree), was used as the assessment method. The second part contained BWDCE tasks and the patient understanding when making BWDCE choices. Patients were asked to rate their ability of understanding on a scale from 0 to 10 in completing the choice tasks. To ensure the validity of the data, we excluded questionnaires with a score of less than 8. The third part was on the medical history of the patients and their clinical symptoms. The first and second parts were fulfilled by patients, and the third part was completed by interviewers using records from the hospital information system.

**Sample size**

We used an ad hoc sample size calculation method proposed by Johnson and Orme:\(^2^3\):

\[
\frac{n_{\text{req}}}{n_{\text{obs}}} \geq 500
\]

where \(n\) is the number of respondents, \(t\) is the number of tasks, \(a\) is the number of alternatives per task and \(c\) is the number of analysis cells. Therefore, the minimum sample size is 112. There were three common types of cancer in our study, so we increased the sample size to ensure the validity of the subgroup analysis.

**BWDCE implementation and data collection**

Our BWDCE was conducted from 4 January 2022 to 1 May 2022. We enrolled patients 18 years of age or older who had a definite diagnosis of lung cancer, breast cancer or colorectal cancer. Patients with one of the three types of cancer were included, mainly due to the high prevalence and overwhelming burden of the disease in China. The patients in our study were recruited from Jiangsu province (ie, two hospitals in Nantong and one hospital in Yancheng) and Hebei province (ie, one hospital in Shijiazhuang). The sample size within each sampling hospital was balanced. We required the hospitals to include an equal number of patients among the three types of cancer and enrol patients with cancer consecutively.

The BWDCE survey was conducted through one-on-one, face-to-face interviews to ensure validity and reliability. Interviewers comprised 11 medical interns and 14 clinicians who had medical knowledge and were able to understand and explain our questionnaires. We developed training manuals before the formal survey. The interviewers were trained face to face or online. We required them to check the completeness of each questionnaire immediately to detect missing information. For patients who felt it was difficult to understand the questions, interviewers were asked to explain the meaning item by item until the patients could understand.

Our study assumed that patients had the opportunity to use a new anticancer drug due to their unsatisfactory clinical symptoms. Patients were asked to think carefully among three different new drugs, choosing the one they considered the best and the worst respectively. The duration of the survey ranged from 30 min to 1 hour per patient. All patients were fully informed about the survey and signed informed consent. We gave each patient who participated in the survey a cotton towel worth CNY10 as a gift.

**Patient and public involvement**

Twenty patients participated in the pilot survey to provide feedback on the acceptability and intelligibility of the questionnaires. Patient responses contributed to a more apprehensible and concise description of the BWDCE questions. The patients participating in the pilot were not involved in the formal survey. No patients took part in the recruitment of study participants or in the conduct of the study.

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**Table 1** Attributes and levels in the best–worst discrete choice experiment

<table>
<thead>
<tr>
<th>Domains</th>
<th>Attributes</th>
<th>Levels</th>
<th>Variables' coding</th>
</tr>
</thead>
<tbody>
<tr>
<td>Survival outcomes</td>
<td>PFS</td>
<td>6 months; 12 months; 24 months</td>
<td>Categorical</td>
</tr>
<tr>
<td>Patient-reported outcomes</td>
<td>Change in HRQoL</td>
<td>Even worse; Slight improvement; Significant improvement</td>
<td>Categorical</td>
</tr>
<tr>
<td>Safety</td>
<td>Incidence of severe to life-threatening side effects</td>
<td>60%, 30%, 10%</td>
<td>Categorical</td>
</tr>
<tr>
<td></td>
<td>Incidence of mild to moderate side effects</td>
<td>90%, 50%, 10%</td>
<td>Categorical</td>
</tr>
<tr>
<td>Affordability</td>
<td>Out-of-pocket costs per month</td>
<td>CNY2000–CNY32000</td>
<td>Continuous</td>
</tr>
</tbody>
</table>

The average exchange rate between US dollars and the CNY from July 2021 to June 2022 was 1: 6.46. CNY2000 was approximately US$309.60 and CNY32 000 was about US$4953.56.

CNY, Chinese yuan; HRQoL, health-related quality of life; PFS, progression-free survival.
Statistical analysis
Data from BWDCE can be used to estimate an indirect utility function using random utility theory. Details of the analysis methods are shown in online supplemental appendix 5. The relative importance (RI) of each attribute was calculated based on the difference between the most and least preferred levels within an attribute (the overall utility value of each attribute) divided by the sum of the overall utility values across all attributes. The greater the difference, the more important the change from the most to the least preferred level.

RESULTS
Characteristics of the patients
A total of 495 patients consented to participate in our BWDCE survey. Twenty-seven patients were excluded from the analysis due to non-compliance with the inclusion criteria, incomplete data or a lack of confidence in choosing choice sets. As a result, data from 468 patients were available for analysis. The sample consisted of more females than males (52.99% vs 47.01%) (table 2). The average age was 62.18 years old, ranging from 28 to 93 years old. Patients in our survey had lung cancer (40.17%), breast cancer (34.62%) or colorectal cancer (25.21%). The vast majority of patients (N=401, 85.7%) wanted to actively participate in SDM (4.32±0.77). Most of the patients (N=388, 82.9%) were willing to use the decision aid to obtain evidence on the value of new anticancer drugs (4.25±0.84).

Model estimation of preferences
We found that the most important attribute that determined patients’ preferences for new anticancer drugs was the improvement in health-related quality of life (HRQoL) (RI 36.68%). The low incidence of severe to life-threatening side effects, prolonged progression-free survival (PFS), and the low incidence of mild to moderate side effects were also positive predictors of patients’ preferences (p<0.001) (table 3). The out-of-pocket cost was a negative predictor of their preferences (β=−0.056, p<0.001).

According to the subgroup analysis by type of cancer, HRQoL remained the most important attribute (RI 35.19%–39.23%) (table 4). Furthermore, the significant improvement in HRQoL was the most valued attribute level, regardless of cancer types (p<0.001). Nevertheless, preferences for other attributes varied among different types of patients with cancer. Patients with lung cancer and colorectal cancer rated the incidence of severe to life-threatening side effects as the second most important attribute when choosing a new drug, while patients with breast cancer paid more attention to the length of PFS. Patients with colorectal cancer favoured the new drugs that had a low incidence of mild to moderate side effects (RI 18.15%) compared with other types of cancer (RI 7.48%–12.93%).

Estimation of preference heterogeneity by interaction effects
In terms of interaction effects by age within each type of patient with cancer, no statistically significant interaction term was identified (online supplemental appendix 6). Similarly, we tested the interaction effects using clinical features. Based on the interaction effects of the cancer stages, only the longest PFS in patients with lung cancer had statistical significance (online supplemental appendix 7). Patients with lung cancer who were diagnosed at stage

<table>
<thead>
<tr>
<th>Table 2</th>
<th>Characteristics of patients with cancer (N=468)</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Variables</strong></td>
<td><strong>N (%)</strong></td>
</tr>
<tr>
<td>Gender</td>
<td></td>
</tr>
<tr>
<td>Male</td>
<td>220 (47.01)</td>
</tr>
<tr>
<td>Female</td>
<td>248 (52.99)</td>
</tr>
<tr>
<td>Age</td>
<td></td>
</tr>
<tr>
<td>&lt;65</td>
<td>255 (54.49)</td>
</tr>
<tr>
<td>65–74</td>
<td>139 (29.70)</td>
</tr>
<tr>
<td>≥75</td>
<td>74 (15.81)</td>
</tr>
<tr>
<td>Education</td>
<td></td>
</tr>
<tr>
<td>Unschool/primary school</td>
<td>187 (39.96)</td>
</tr>
<tr>
<td>Junior high/high school</td>
<td>201 (42.95)</td>
</tr>
<tr>
<td>Junior college or higher vocational college</td>
<td>49 (10.47)</td>
</tr>
<tr>
<td>Bachelor’s degree or above</td>
<td>31 (6.62)</td>
</tr>
<tr>
<td>Employment</td>
<td></td>
</tr>
<tr>
<td>Farmer</td>
<td>152 (32.48)</td>
</tr>
<tr>
<td>Urban employee</td>
<td>138 (29.49)</td>
</tr>
<tr>
<td>Freelancers</td>
<td>42 (8.97)</td>
</tr>
<tr>
<td>Unemployed</td>
<td>7 (1.50)</td>
</tr>
<tr>
<td>Retiree</td>
<td>129 (27.56)</td>
</tr>
<tr>
<td>Monthly household income (CNY)</td>
<td></td>
</tr>
<tr>
<td>≤2000</td>
<td>77 (16.45)</td>
</tr>
<tr>
<td>2001–4000</td>
<td>88 (18.81)</td>
</tr>
<tr>
<td>4001–6000</td>
<td>96 (20.51)</td>
</tr>
<tr>
<td>6001–8000</td>
<td>85 (18.16)</td>
</tr>
<tr>
<td>8001–10000</td>
<td>54 (11.54)</td>
</tr>
<tr>
<td>&gt;10000</td>
<td>68 (14.53)</td>
</tr>
<tr>
<td>Types of cancer</td>
<td></td>
</tr>
<tr>
<td>Lung cancer</td>
<td>188 (40.17)</td>
</tr>
<tr>
<td>Breast cancer</td>
<td>162 (34.62)</td>
</tr>
<tr>
<td>Colorectal cancer</td>
<td>118 (25.21)</td>
</tr>
<tr>
<td>Duration of cancer diagnosis</td>
<td></td>
</tr>
<tr>
<td>Newly diagnosed*</td>
<td>243 (51.92)</td>
</tr>
<tr>
<td>Previously diagnosed</td>
<td>225 (48.08)</td>
</tr>
</tbody>
</table>

*Patients who received a cancer diagnosis within 3 months at the time of enrolment and the diagnosis of cancer were not attributed to metastatic or recurrent causes (no previous history of cancer).
CNY, Chinese yuan.
III or IV showed stronger preferences for the longest PFS ($\beta = 0.547$, $p < 0.01$).

The interaction effects of whether the patients had newly or previously diagnosed cancer cases seemed to be more important than the effects of the cancer stages. We found that previously diagnosed patients with lung cancer paid more attention to the longest PFS ($\beta = 0.422$, $p < 0.05$), and might trade the lower incidence of side effects for the prolongation of the PFS. However, newly diagnosed patients with breast cancer placed more emphasis on PFS ($p < 0.01$). Our results also revealed that previously diagnosed patients with colorectal cancer cared more about the significant improvement in HRQoL ($p < 0.05$).

**DISCUSSION**

**Patients’ preferences for new anticancer drugs**

The BWDCE collects more abundant information from a choice scenario than a conventional DCE since it asks not only for the best (most preferred) but also the worst (least preferred) alternative.\(^2^7\) It has the benefit of obtaining a larger number of observations per respondent. To the best of our knowledge, this is the first BWDCE that involved three common types of patients with cancer and investigated preference heterogeneity within each group. Our findings provide a new understanding of the RI patients attach to different attributes of new anticancer drugs, thus informing the effective implementation of SDM.

We found that the new anticancer drugs patients preferred comprised the following attributes: improving patient-reported health status as reflected by HRQoL; causing few side effects, especially severe to life-threatening events; extending survival and requiring less out-of-pocket costs. Currently, there is a lack of studies comparing the RI of preferences for each attribute among common types of patients with cancer, making it difficult to facilitate SDM due to fragmented preference evidence. Our results revealed both similarities and differences in patients’ preferences by type of cancer. We found that patients considered improvement in HRQoL to be the most important attribute, regardless of cancer type. In addition to the improvement in HRQoL, patients with breast cancer preferred extended PFS, while patients with lung cancer and colorectal cancer were concerned about the incidence of severe to life-threatening side effects. Hence, the preferences of patients with a specific type of cancer may not be applicable to other types of cancer.

Few studies have identified the influence of demographic characteristics and clinical features on patients’ preferences for cancer therapy. Based on our results, age did not significantly affect patients’ preferences for new anticancer drugs. We have a new finding that whether patients were newly diagnosed or previously diagnosed cancer cases had a noticeable influence on their clinical decisions. Patients with previously diagnosed lung cancer showed stronger preferences for the longest PFS. Coincidentally, according to a DCE on patients’ preferences for lung cancer treatment, those who received more than one line of anticancer therapy attached more importance to the longest PFS.\(^2^8\) Synchronous lung metastasis occurs frequently and is an independent predictor of a poor survival rate.\(^2^9\) However, newly diagnosed patients with breast cancer placed more emphasis on prolonged PFS. This could be explained by the fact that if breast cancer is diagnosed and treated early, the chance of survival is relatively high,\(^3^0\) and newly diagnosed patients would express a higher expectation of survival.

Furthermore, we found that previously diagnosed patients with colorectal cancer cared more about improving HRQoL. A study showed that colorectal patients who were 1–3 years after diagnosis would be exposed to a significant HRQoL burden, including urinary incontinence, bowel control problems and sexual matters.\(^3^1\) Therefore, they may be more concerned with maintaining daily activities and improving HRQoL.

**Implications of the study findings**

Treatment of cancer is often complex, and clinical decisions on new anticancer drugs involve uncertainties, making it well suited for studying SDM. Key SDM goals will be achieved when patients are fully informed...
of treatment options and patient values are incorporated into treatment decisions. 32 Meanwhile, achieving good adherence to medications requires a better understanding of patients’ preferences.33 34 Despite different types of patients with cancer, the attributes of new anticancer drugs involving survival outcome, PROs, safety and affordability were found to affect their clinical decisions. Although the RI of attributes varies among patients with different types of cancer, they are all necessary to implement SDM. For example, the out-of-pocket cost is indispensable when making decisions between drugs where health benefits and safety do not differ significantly. Patients should be aware of the multi-attribute value of new anticancer drugs and be jointly involved in decision-making while honouring their preferences.

SDM is central to evidence-based medicine and high-quality care,35 but this does not mean that “one-size-fits all”.36 We observed preference heterogeneity among three common types of patients with cancer. Our BWDCE has a new finding that the improvement of HRQoL is a high priority for each type of patient with cancer. Cancer considerably affects all dimensions of patients’ daily life and makes them vulnerable to deteriorated HRQoL.37 38

The importance of capturing and reporting HRQoL in clinical trials has been increasingly recognised in the field of oncology. 39 40 Although improvement in HRQoL played a dominant role in patients’ preferences, there were variations in preferences for other attributes. Differences in the RI of attributes underscore the need for effective communications between clinicians and patients on drug values, which would contribute to more personalised treatment decisions.

With a growing emphasis on the patient-centred care model that incorporates patient values into shared decisions, it is necessary to recognise variations in patients’ preferences and values.41 Patients with previously diagnosed cancer were often excluded from clinical studies, despite limited evidence on their prognosis and preferences. We have a new finding that patients’ preference heterogeneity could mainly be driven by whether they were newly diagnosed or previously diagnosed cancer cases. Therefore, patients’ preferences for new anticancer drugs may change over the course of their disease experience.

Whether patients were newly diagnosed or previously diagnosed cancer cases should be considered as a possible factor affecting patients’ preferences in clinical

### Table 4 Subgroup analysis of patients’ preferences by type of cancer

<table>
<thead>
<tr>
<th>Attributes/levels</th>
<th>Lung cancer</th>
<th>Breast cancer</th>
<th>Colorectal cancer</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Coef.</td>
<td>RI (%)</td>
<td>Coef.</td>
</tr>
<tr>
<td>PFS</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>6 months</td>
<td>−0.596*</td>
<td>8.34</td>
<td>−1.874*</td>
</tr>
<tr>
<td>12 months</td>
<td>0.219†</td>
<td></td>
<td>0.589*</td>
</tr>
<tr>
<td>24 months</td>
<td>0.377†</td>
<td></td>
<td>1.285*</td>
</tr>
<tr>
<td>Change in HRQoL</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Even worse</td>
<td>−2.791*</td>
<td>39.23</td>
<td>−2.935*</td>
</tr>
<tr>
<td>Slight improvement</td>
<td>1.008*</td>
<td></td>
<td>1.024*</td>
</tr>
<tr>
<td>Significant improvement</td>
<td>1.783*</td>
<td></td>
<td>1.911†</td>
</tr>
<tr>
<td>Incidence of severe to life-threatening side effects</td>
<td>24.32</td>
<td></td>
<td>18.03</td>
</tr>
<tr>
<td>60%</td>
<td>−1.790*</td>
<td></td>
<td>−1.582*</td>
</tr>
<tr>
<td>30%</td>
<td>0.744†</td>
<td></td>
<td>0.700*</td>
</tr>
<tr>
<td>10%</td>
<td>1.046†</td>
<td></td>
<td>0.882*</td>
</tr>
<tr>
<td>Incidence of mild to moderate side effects</td>
<td>12.93</td>
<td></td>
<td>7.48</td>
</tr>
<tr>
<td>90%</td>
<td>−0.999†</td>
<td></td>
<td>−0.670†</td>
</tr>
<tr>
<td>60%</td>
<td>0.491†</td>
<td></td>
<td>0.319†</td>
</tr>
<tr>
<td>10%</td>
<td>0.508*</td>
<td></td>
<td>0.351†</td>
</tr>
<tr>
<td>Out-of-pocket costs per months</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Cost (per CNY1000)</td>
<td>−0.059*</td>
<td>15.18</td>
<td>−0.072†</td>
</tr>
<tr>
<td>Log likelihood</td>
<td>−1422.3154</td>
<td></td>
<td>−1188.7416</td>
</tr>
<tr>
<td>Participants</td>
<td>188</td>
<td></td>
<td>162</td>
</tr>
<tr>
<td>Observations</td>
<td>6768</td>
<td></td>
<td>5832</td>
</tr>
</tbody>
</table>

*p<0.001 †p<0.01

CYN, Chinese yuan; HRQoL, health-related quality of life; PFS, progression-free survival; RI, relative importance.
practice to promote SDM. Patients’ varied preferences for prolonging PFS might be due to their prognostic patterns and expectations for anticancer treatment. The overall unadjusted 5-year follow-up survival proportion was estimated to be 82.6% for breast cancer and 16.3% for lung cancer. On average, the prognosis of lung cancer remains poor, and cases are often diagnosed at later stages. Preferences for the longest PFS among previously diagnosed patients with lung cancer also indicate a substantial need for improved lung cancer diagnostic and treatment approaches. Despite the variations in patients’ preferences, early diagnosis, followed by timely, patient-centred, and appropriate anticancer therapy, is critical to improve health outcomes.

Patients need information that matches their individual needs, and clinicians need support on how to best involve the individual patient in the decision-making process. There is a high demand for SDM but a lack of conclusive evidence on the specific information needs of patients. Our findings also provide evidence on what kind of information patients with common types of cancer would like to receive when it comes to making decisions about new anticancer drug therapies. Communications between patients and clinicians about therapeutics play a crucial role in cancer care by improving patient consent and reducing uncertainty in SDM. Meanwhile, decision aids that provide scientific evidence and help patients evaluate their treatment options deserve to be developed and applied in clinical practice.

**Strengths and limitations**

The major contributions of our study are as follows. First, we performed a BWDCE that followed good research practices, offering the advantages of measuring trade-offs in patient choices and quantifying the strength of preferences. Compared with a standard DCE, the BWDCE can increase the statistical efficiency of the choice models. It becomes a useful tool to provide plentiful sources of preference information. Second, our study, for the first time, compared preferences for new anticancer drugs among three common types of patients with cancer. The findings will enrich the research evidence on preferences of patients with cancer in a systematic and in-depth manner. Third, our study suggests that whether patients are newly diagnosed or previously diagnosed cancer cases has a potential impact on their preferences. The results will facilitate patient-centred decision-making. Fourth, our findings would be helpful for the further development of decision aids that provide evidence to reflect the multiattribute value of new anticancer drugs. Finally, our study highlights the importance of understanding patients’ preferences when implementing SDM, thus improving patient participation in decisions and better aligning anticancer drug therapies with their individual priorities.

Despite the strengths, several limitations of our study should be acknowledged. First, we used a subset of prominent attributes that were identified from the literature review and expert consultation. Due to the methodological requirements of BWDCE, our analysis was unable to include other attributes that could also be meaningful. Second, our study only enrolled three common types of patients with cancer, which might limit the applicability of the findings. Future studies are suggested to enrol patients with other types of cancer. Finally, the BWDCE presents hypothetical choices that may not fully represent the choices respondents have or would make in real-world decision scenarios.

**Conclusion**

In summary, our study suggested that patients with cancer, in general, value several attributes of new anticancer drugs, including HRQoL, toxicity and safety, survival outcomes and affordability. The most influential driver of patients’ preferences was the significant improvement in HRQoL. Patients’ preferences varied according to whether they were newly diagnosed or previously diagnosed cancer cases. During the process of SDM, patients should be informed about the multiattribute values of drugs, empowered to think critically, and encouraged to make decisions reflecting their values.

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**Contributors**

JG accepts full responsibility for the work and/or the conduct of the study, had access to the data, and controlled the decision to publish. JG and GW conducted the study design. JM and TX contributed to the literature search and qualitative analysis. JG and JM took part in the design of the questionnaire and data interpretation. YS, JM, WL, and GW contributed to the implementation and quality control of the best–worst discrete choice experiment. ZF and JG performed the statistical analysis and wrote the manuscript.

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**Competing interests**

None declared.

**Patient and public involvement**

Patients and/or the public were not involved in the design, or conduct, or reporting, or dissemination plans of this research.

**Patient consent for publication**

Not applicable.
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