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Tailoring Chemotherapy Supply According to Patients' Preferences: A Quantitative Method in Colorectal Cancer Care.

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Abstract

Objectives: The aim of this study was to conduct a discrete choice experiment with patients affected by colorectal cancer to understand their preferences for different attributes of the chemotherapy supply. Our overall goal is to provide evidence on the relative importance of each attribute in order to tailor chemotherapy supply according to patients' priorities in the design or reorganization processes of cancer services.

Methods: Focus groups were used to identify the attributes and levels for the discrete choice experiment. The attributes were: continuity of care, understanding, information, treatment choice, and time for therapy. Respondents were asked to choose between two mutually exclusive hypothetical alternatives of chemotherapy supply. Patients completed the discrete choice experiment along with health-related quality of life and patients' satisfaction questions. Conditional and mixed logistic models were used to analyses the data.

Results: Patients with colorectal cancer treated with chemotherapy (n=76) completed the survey. The most important aspects of chemotherapy supply were: "Providing detailed and complete information" and "High ability in understanding" patients. Preferences were also influenced by the availability of a trusted doctor. Except for one attribute (waiting time for therapy), all other characteristics significantly influenced respondents' preferences.

Conclusions: Results should support a policy of strengthening medical doctors' capabilities to communicate with patients, providing them complete information and involving them in the clinical decisions. Specifically, the findings should be used to improve current provision of cancer care by identifying areas of preferred intervention from the perspectives of patients in order to tailor the service supply accordingly.

Keywords: patient satisfaction; chemotherapy; discrete choice experiment; patient preferences.

Short title: Patients' preferences on outpatient chemotherapy.

Introduction

In cancer care, although the outcomes of treatment are very important to patients, recent years have seen a growing interest in patient satisfaction [1]. Dissatisfaction with care can compromise compliance with beneficial treatment recommendations, and thereby undermine therapeutic effectiveness, prognosis and outcomes [2-4].

Given the relevance of patient-centred care as a quality dimension, its monitoring should be ensured by specific measurement systems, in line with the provisions for effectiveness, efficiency and safety. In cancer treatment centres, patients should routinely be surveyed with respect to several relevant domains, such as physical comfort, emotional support, enabling informed decision-making, respect for patients' preferences and values, involvement of family and friends and continuity of care [5].

When the objective is to study or understand predictors of patient satisfaction regarding the service experienced, diverse methodologies are available, including self-reported questionnaires, in-depth interviews, focus-group discussions and analyses of patient feedback and concerns. Results can be used by healthcare providers to understand weaknesses in the delivery process, in order to design and track quality improvement.

Stated-preference methods, such as discrete choice experiments (DCEs), provide a means to elicit information about which features of healthcare systems patients would value most highly if they had the opportunity to choose [6-9]. The evidence produced can provide information on patients' expectations and can contribute to the design of new healthcare delivery systems or to improving current ones, using a patient-centred approach.

In the DCE framework, a good or service can be described by a set of characteristics, also known as attributes, which are in turn scaled at different levels. DCEs are typically carried out in studies that consist of a series of choice tasks. A choice task consists of two or more realistic but hypothetical options, (i.e., "choice sets" in DCE nomenclature), from which patients are invited to choose. In DCEs, respondents must choose between two or more options that are characterized by varying levels of the options' relevant features, (i.e., attributes). The choice of attributes is a key issue in DCEs. The

literature suggests involving the main stakeholders through interviews or focus groups, to identify the aspects that will be used to describe the service [6, 10]. Respondents are expected to make a trade-off between attributes, under the assumption that individuals choose the alternative that maximizes their utility. Patients' preferences are derived through the estimation of the weights that respondents place on each attribute defining the cancer care service.

In cancer care, in recent years, DCEs have been widely used to investigate patient preferences, mainly with regard to treatments [11-16] and screening programmes [17, 18], with most of the studies related to colorectal screening [17, 19-23]. Studies conducted to determine patients' preferences in cancer care management are less common [24-28].

In 2000, Piedmont Region established a regional cancer network (RCCN), with the aim of guaranteeing homogeneous and uniform care over the whole region and supporting patients in every phase of the disease, using a patient-centred approach (http://www.reteoncologica.it/). For this purpose, two organizational bodies were created: the "Service and Reception Centre", for the first reception of the patient and for offering support during the patterns of care and the "Interdisciplinary Care Group", where different specialists discuss the case and plan the therapeutic approach together. The extent to which the patient-centred organization of the RCCN is really meeting patient preferences has not yet been assessed.

Using a discrete choice experiment (DCE), the aim of the present study was to estimate patient preferences for different attributes of the chemotherapy supply in a sample of colorectal cancer patients at the largest referral centre of the RCCN. Preference heterogeneity between patients and the impact on preferences of satisfaction regarding the service previously experienced, were also assessed.

Our overall goal is to provide evidence on the relative importance of each attribute, in order to tailor chemotherapy supply according to patients' priorities in the design or reorganization processes of cancer services.

Methods

Participants

The present study was nested within a prospective study aimed at evaluating changes in quality of life in colorectal cancer patients, between diagnosis and six-month follow-up. Respondents were enrolled at the cancer care unit of the "Città della Salute e della Scienza" hospital of Turin, between October 2014 and October 2016. Inclusion criteria were a new diagnosis of CRC and patient ages greater than 18 years. Patients with previous neoplasm, cognitive disorders (clinical judgement) or insufficient understanding of the Italian language were excluded. In this prospective study, patients were enrolled during the first multidisciplinary visit to decide chemotherapy treatment and were re-evaluated at the six-month follow-up visit (between April 2015 and April 2017). At baseline respondents completed demographic and self-reported health status and mood disorders questionnaires. At the follow-up visit, in addition to the previous questionnaires, they also filled out a questionnaire assessing satisfaction with the service experienced. Moreover, the DCE was offered to a subsample of all the patients receiving chemotherapy who were willing to participate in the experiment. They were then presented with information about the DCE tasks, including the attributes used, and instructed to imagine the cancer care service that they could have experienced. A member of the research team was available to help in filling out the questionnaire. All analyses reported in the present paper refer to the six-month follow-up visit. The study was conducted in strict accordance with the ethical guidelines in the Declaration of Helsinki and was approved by the Human Research Ethics Committee at "Città della Salute e della Scienza" hospital (registration number 0077310). All participants were informed about the study and consented to participation. They were assured that participation was voluntary. Participants were also assured that refusal to participate would not affect their care.

Discrete Choice Experiment

To establish the most relevant attributes of an oncology service, we used the results of four focus groups involving the main "stakeholders", two with cancer patients and caregivers and two with

professionals (doctors and nurses), lasting about two hours each. Twelve patients were recruited from the outpatient service of the cancer care unit, using the method of purposive sampling, which aims to obtain maximum variation in patient characteristics [29], including age and cancer sites (breast, colorectal or haematological cancers). Five paired caregivers also participated. Focus groups for professionals included 12 voluntary participants with different specializations (breast, colorectal or haematological cancers). Focus groups were conducted by two researchers with experience with healthcare service patients: a skilled moderator who helped participants to identify the core attributes of the chemotherapy service delivery and an observer who concentrated on group dynamics and noted the discussion. The focus groups were conducted in three steps, directly recording contributions with written notes. First, the aim of the study was presented, and participants were invited to focus on their personal experience with the cancer care service. Second, two brainstorming conversations took place, where each participant spontaneously indicated: 1) the most relevant aspects of the cancer care service (attributes) for him or her and 2) the list of levels for each aspect. In the third step, the attributes and levels identified were synthetized for patients. Five key attributes likely to influence the patient's satisfaction were identified: continuity of care, understanding, information, treatment choice and time for therapy. These attributes were scaled at two or three levels, as reported in Table 1.

The DCE consisted of several choice sets (scenarios), each containing two mutually exclusive hypothetical alternatives for chemotherapy supply. Alternatives were characterized by different levels of a set of attributes. The DCE response format used was the "pick-one" option. For each scenario, respondents were asked which hypothetical chemotherapy service was, in their opinion, preferable. In line with the main objective of the study, to investigate single aspects of the cancer care service with respect to patient satisfaction, the DCE was of an unlabelled type [30], with generic titles for the alternatives (service "A" or "B" in Figure 1).

To construct the choice sets (scenarios), experimental designs were used, so that the attributes were uncorrelated and therefore yielded unconfounded estimates of the parameters. The combination of

attributes and levels in the study resulted in (3^3*2^2) = 108 possible alternatives. A full fractional design, incorporating all possible scenarios, could enable all interaction effects to be investigated. However, this is not feasible, particularly for older patients with cancer, who are unlikely to be able to handle a large number of choice sets. To provide a manageable task for respondents, the D-optimality criterion was used to maximize the efficiency of the design [30]. Eighteen choice sets with two alternatives, (i.e., hypothetical cancer services), were constructed. To make the questionnaire more manageable for patients, the choice sets were split into two blocks of nine, and half the respondents were randomly assigned to each block. Each patient was required to complete one block. The scenarios were randomized to prevent order effects bias. One additional control scenario, with the best (favourite) level of all attributes, was used as a validity test. The additional scenario was excluded from the analyses.

On the basis of the rule of thumb proposed by Johnson and Orme [31], the sample size (N) required to estimate the main effects of the attributes should be N > 500c /(t x a), where *t* is the number of choice sets, *a* is the number of choices per task and *c* is the largest number of levels for any one attribute. With 18 choice sets (t = 18), five attributes scaled by three levels (c = 3) and two alternatives (a = 2), a sample size of 42 was required. This sample size is in line with the DCE literature, suggesting that the minimum number of participants per block should be 20, i.e., a minimum sample size of 40 participants for a two-block design [10].

Questionnaires

Before performing the DCE, respondents filled out the Italian validated version of the following questionnaires: the Hospital Anxiety and Depression Scale (HADS) for measuring emotional disorders, the EORTC IN-PATSAT32 questionnaire for estimating satisfaction with the service received during their previous treatment and the EORTC QLQ-C30 questionnaire on quality of life.

The HADS is a screening tool comprising 14 multiple-choice items (0-3 score range for each), seven items probing symptoms of anxiety and seven probing symptoms of depression. HADS anxiety and depression scores can range from 0 to 21 (most severe symptoms) [32, 33].

The EORTC IN-PATSAT32 is a 32-item questionnaire organized into 11 multi-item scales and three single items. The subscales are measures of: doctors' and nurses' technical skills, (e.g., knowledge, experience, assessment of physical symptoms), interpersonal skills, (e.g., interest, willingness to listen) information provision (about the disease, medical tests and treatment) and availability, (e.g., time devoted to the patient), together with satisfaction with other hospital staff (receptionists, laboratory assistants, technicians), interpersonal skills and information provision, exchange of information within the care team, waiting time, hospital access, hospital comfort and overall satisfaction with care. The IN-PATSAT32 scales range from 0 to 100, with higher scores reflecting a higher level of satisfaction [34].

The EORTC quality-of-life questionnaire (QLQ-C30) [35] is composed of 30 items that define six functional dimensions (emotional, physical, global health, cognitive, role and social), eight symptoms (appetite loss, constipation, fatigue, nausea/vomiting, pain, diarrhoea, dyspnoea and insomnia) and one item related to financial problems. These dimension scores range from 0 to 100. For functional dimensions, a higher score represents a higher level of QoL, while for the symptoms scale lower values indicate a better QoL.

Additional data collected included the patient's age, gender, educational level, marital status, type of cancer (colon/rectum) and TNM cancer stage, classified as early stage (I or II) versus advanced stage (III or IV).

Data Analysis

Respondents' characteristics were described as means and frequencies. The IN-PATSAT32 satisfaction subscale and the QLQ-C30 quality-of-life functional subscale, were synthetized as means and standard deviations, while the QLQ-C30 symptoms were presented as percentages, due to their

low frequencies. HADS anxiety and depression scales were presented both as means and standard deviations and as a percentage of respondents with a pathological or borderline score (HADS score > 8). Non-responders' characteristics were analysed to assess possible selection bias. Patients' characteristics were also analysed stratifying by stage of disease and cancer site.

Data from the DCE were analysed within the framework of random utility theory, which assumes that respondents choose the alternative that maximizes their utility. A conditional logistic regression model was initially used, assuming a homogeneous preference among all respondents. In order to investigate the potential existence of preference heterogeneity, a mixed logistic regression model was also considered. The Bayesian Information Criterion (BIC) and McFadden's pseudo R-squared (R^2) were used to compare the conditional and mixed logit models. As a rule of thumb, well-fitted models occur with a pseudo R^2 greater than 0.30 [30]. Attribute levels were included in the analysis as dummy variables.

The conditional logit regression model was also stratified according to the median value of the general satisfaction, as measured by the IN-PATSAT32 scale. The general satisfaction dichotomous variable was also included in the model as interacting with the attributes.

DCE analyses were performed using the statistical software package NLOGIT version 4.0 [36], and other analyses were performed using SAS [37].

Results

Respondent Characteristics

The prospective study enrolled 258 colorectal cancer patients. One hundred and forty-two underwent chemotherapy and were invited to complete the DCE survey during the six-month follow-up visit. The actual number of respondents was 76, mainly due to complexity of the DCE. One patient was excluded from the analysis after failing the additional control scenario test. No statistical differences were found between respondents and non-respondents, for demographic data and IN-PATSAT32 subscales (appendix 1, table A1).

Table 2 summarizes the demographic and clinical characteristics of the 75 respondents. Fifty percent of the respondents were males (n = 39) with a mean age of 61.6 years (s.d. = 10.6). Sixty-four percent of respondents lived with a partner. The majority had a diagnosis of colon cancer (64%), and about 20% had stage I-II disease.

Anxiety and depression scores were on average low, with only 16% and 12% of patients with borderline or pathological anxiety and depression respectively (scores > 8).

The sample reported high QoL scores (mean value exceeding 80) on almost all functional scales, except for the global health scale, with an average score of 67. The overall good health status of these patients was also evidenced by the low prevalence of almost all symptoms, except fatigue, which was present in 81% of cases.

Results from the IN-PATSAT32 questionnaire are shown in Figure 2. Mean satisfaction scores for doctors ranged from 72.3 (doctor availability) to 75.7 (doctors' technical skills). Mean satisfaction scores for nurses ranged from 70.1 (nurse information) to 78.8 (nurses' technical skills). The lowest mean score was 58.8, which related to hospital access. Overall, the mean general satisfaction score was 75.7. Neither the patients' characteristics nor any of the measured scales were associated with the cancer site or stage (appendix 1, table A2 and A3).

Results of DCE Experiment

The conditional logit estimates for the study sample are reported in Table 3. All attributes had a positive coefficient sign as expected, having fixed the worst option as the reference category. For example, the "information" attribute has a positive value indicating that utility increases in the presence of a doctor providing information (generic or detailed) about the disease and treatments. Moreover, the sizes of coefficients also indicate that they were logically ordered (higher impact on utility for detailed and complete information). Except for one attribute (time for therapy), all other cancer care services characteristics considered in this study significantly influenced respondents' preferences. "Providing detailed and complete information" and "High ability to understand" were

the most important attributes. Table 4 reports random logit estimates investigating the potential for preference heterogeneity in respondents. Nevertheless, using a mixed logit model improved the model fitting compared to the conditional logit model, as evidenced by the BIC statistics, (i.e., lower is better) and McFadden's pseudo R^2, (i.e., higher is better). Ranking of preferences was similar in both models, but taking into account patient heterogeneity, all cancer care service attributes were statistically significant ($p < 0.01$). Coefficients for standard deviations suggest a relevant heterogeneity among respondents, particularly in the assessment of "treatment choice" and "understanding".

A subgroup analysis was undertaken, stratifying the whole sample by general satisfaction score (lower/upper median score of 75). Results are reported in Table 5. Overall, no relevant differences were observed. In the subsample of respondents with lower general satisfaction scores (≤ 75), the sign and significance of the attributes remained unchanged. For those with high general satisfaction, "continuity of care" and "time for therapy" became not statistically significant. When the general satisfaction dichotomous variable was also included in the main model as interacting with the attributes, only "time for therapy", as an interaction term, was significant.

Discussion

The aim of this study was to explore patients' preferences regarding chemotherapy supply in a cohort of colorectal cancer patients at the cancer care unit of a referral centre of the RCCN. Since the RCCN has a strong commitment to guarantee a patient-centred approach, the need for robust evidence on patients' preferences has been identified as a research priority, for better tailoring of the organizational strategies. This study provides evidence, supported by quantitative methods, on the relative importance of each attribute in order to tailor chemotherapy supply according to patients' priorities. Results can be used in the design or re-organization processes of cancer services.

DCE analysis has been identified as the proper approach to provide a measure of the preferences of patients towards relevant dimensions of cancer care services, and to assess the presence of

heterogeneity among patients [38]. This approach has not generally been used in the context of cancer services management, apart from in screening programmes, but it has the potential to be strongly informative. The study has also the objective of understanding the potential of using this approach in cancer care management, in order to make the decision process more transparent and explicit [39].

Specifically, in the context of shared decision-making as a means of engaging patients in their health care choices, the findings of this study should be used to improve current provision of cancer care by identifying areas of preferred intervention from the perspectives of patients, in order to tailor the service supply accordingly. As highlighted by patient-centred care and shared decision-making approaches, if the patient's core values and goals are taken into account, the clinicians are facilitated in supporting patients with their healthcare choices. Shared decision-making results in lower utilization of healthcare resources, creates more patient autonomy and improves patient outcomes [40-43].

The attributes of the service that have been found to be most preferred by patients were those related to the doctor's interpersonal skills, specifically understanding, ability to provide information about the disease, therapies and prognosis and ability to involve patients in the decision-making process regarding their care. Results on interpersonal skills are in line with the literature, where understanding, empathy and relational versatility have been identified as relevant [44, 45]. Desire for substantial engagement in decision-making has previously been demonstrated among breast cancer patients [46, 47]. Furthermore, Schmidt and colleagues [2016], observed that preferences were not homogenous among lung cancer patients, and some subjects seemed to prefer a passive rather than an active role in decision-making [48]. The present study has shown a greater preference in patients for being involved in the decision-making process rather than choosing their own treatment after consulting the doctor, as already reported in the literature for colorectal cancer [49].

The least relevant factor was the waiting time for obtaining the therapy, suggesting a relatively minor role for patients' preferences regarding tangible organizational aspects, compared with interpersonal, emotional and supportive ones. Since in the IN-PATSAT32 questionnaire, patients reported scores

for hospital access that were lower than those related to doctors' and nurses' interpersonal skills, we could expect to observe higher preferences for tangible organizational aspects from DCE also. However, doctors' and nurses' interpersonal skills scored higher. As observed by Petrosyan [2017], the results of questionnaires on patient satisfaction must always be evaluated with caution: high satisfaction scores may not necessarily reflect excellent service, but merely a reluctance to criticize and the social unacceptability of complaining [50]. Nevertheless, preferences originating from the DCEs reflect the individual priority rankings of respondents. Indeed, in the results of our stratified analysis, preferences were not even affected by the general satisfaction measured by the IN-PATSAT32 instrument.

To the best of our knowledge, this is the first Italian DCE to study preferences with respect to cancer care services and should help to inform reorganization of clinical practice supply in this context. Within the RCCN, these results should support a policy of strengthening medical doctors' abilities to communicate with patients, to provide complete information and to involve patients in clinical decisions. This objective could be achieved, for instance, with specific training on improving relational skills and increasing the time dedicated to dialogues with patients.

Attributes were identified through focus groups with patients, caregivers and professionals, with a strong linkage with the local context, according to literature suggestions regarding patient-centred care [51]. It is thought that, since the attributes investigated are not context specific, the present conclusions are likely to be generalizable to the organization of chemotherapy services within the National Healthcare Service (Italian Servizio Sanitario Nazionale), in various organizational contexts and for different types of cancers.

As well as the practical and specific suggestions arising from the results, the study is important as a first attempt to provide a new kind of approach, suitable for application to other phases of the pattern of care, various organizational contexts and other types of cancer.

A general limitation of the study is the low sample size that prevented in-depth investigation of the heterogeneity of preferences among patients. Although the number of patients participating in the

DCE (N = 75) was greater than that required by the sample size calculation for principal effect detection (N = 48), it was not large enough for interactions analysis. Unfortunately, the exclusion criteria did not allow the number of subjects to be increased sufficiently in the DCE, considering the average age of colorectal cancer patients and the presence of cognitive impairment.

Another limitation of the study that must be acknowledged is the sample heterogeneity, due to the inclusion of both colon and rectum cancers, at all stages, with every possible pattern of care besides chemotherapy. Restricted inclusion criteria would have improved the homogeneity of the sample but would have reduced the study sample size and its generalizability. As colon and rectum cancers, independently of the stage, share the same outpatient cancer care organization in RCCN (the same physical spaces and equipment), heterogeneity due to the cancer site or stage is not likely to strongly affect preferences. No relevant differences in self-reported patient satisfaction and quality of life were identified in association with cancer site and stage. Therefore, preferences for cancer service attributes should not vary.

Finally, these results should be discussed with decision-makers on the one hand, and professionals on the other, in order to understand how to translate information on patient preferences into organizational and behavioural changes in cancer care.

Transparency

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Author Contributions

RR and EP planned and designed the study and drafted the manuscript. RR and DDC collected data and performed data analysis. PR, GR, LF and SB assisted with the study design, data collection and writing the manuscript. All the authors discussed the results and read and approved the final manuscript.

Declaration of Financial/Other Relationships

None of the authors have any significant relationships with, or financial interests in, any commercial companies related to this study or article. The authors have indicated that they have no conflicts of interest with regard to the content of this article.

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Figure 1. An example of one of the discrete choice scenarios. Participants were asked to choose which hypothetical service (A or B), in each scenario, was preferred.

Attribute	Service A	Service B
The patient has a trusted (reference) doctor	Yes	Yes
Doctor's interpersonal skills	High ability	Low ability
Provision of information about disease, prognosis and treatments by medical doctors	Not complete	Detailed and complete
Person making treatment choice	The patient after consulting the physician	The physician alone
Waiting time for starting therapy	Less than 4 hours	More than 5 hours
Which hospital would you choose? (Tick one box only)	□	□

Table 1. Discrete choice experiment attributes: descriptions and levels.

Attributes	**Description**	**Levels**
Continuity of care	Availability of a trusted doctor	Yes No
Understanding	Willingness to listen of the personnel	High ability Low ability
Information	Information provision about disease, prognosis and treatments by the medical doctors	Detailed and complete Generic Not complete
Treatment choice	Who makes the final choice of the patient's treatment?	The physician alone The physician and the patient together The patient after consulting the physician
Time for therapy	Waiting time for starting therapy	Less than 4 hours Around 4-5 hours More than 5 hours

Table 2. Respondents' characteristics (N = 75).

Characteristics	N (%)
Age, mean years (SD)	61.6 (10.60)
≥ 65 years	34 (45)
Gender: male	39 (52)
Education level: high school or degree	38 (50.70)
Living with partner	48 (64.0)
Type of cancer:	
Colon	48 (64.0)
Rectum	27 (36.0)
TNM stage: III or IV	59 (78)
Surgery: yes	53 (70.7)
HADS anxiety, mean (SD)	5.13 (3.6)
>8	12 (16)
HADS depression, mean (SD)	3.75 (3.6)
>8	9 (12)
QLQ-C30 functional scales, mean (SD)	
Physical	82.0 (17.0)
Role	80.7 (23.3)
Emotional	83.8 (16.2)
Cognitive	88.7 (16.9)
Social	83.8 (22.1)
Global health	67.4 (20.9)
QLQ-C30 symptoms scales	
Appetite loss>0	27 (36)
Constipation>0	23 (31)
Fatigue>0	61 (81)
Nausea/Vomiting>0	26 (35)
Pain>0	31 (41)
Diarrhoea>0	22 (29)
Dyspnoea>0	27 (36)
Insomnia>0	34 (45)
Financial problems>0	15 (20)

SD: standard deviation.

Table 3. Conditional logit estimates of patients' preferences regarding cancer care services.

Attributes	**Coefficients**	**SE**
Continuity of care		
No (reference)		
Yes	0.57	(0.11)**
Understanding		
Low ability (reference)		
High ability	1.13	(0.11)**
Information		
Not complete (reference)		
Generic	0.31	(0.15)*
Detailed and complete	1.20	(0.14)**
Treatment choice		
The physician alone (reference)		
The physician and the patient together	0.84	(0.14)**
The patient after consulting the physician	0.33	(0.15)*
Time for therapy		
More than 5 hours (reference)		
Around 4-5 hours	0.22	(0.11)
Less than 4 hours	0.35	(0.14)*
Log-likelihood function	-464.7399	
Info. criterion: BIC	1.38666	
McFadden's pseudo R-squared	0.302	
No. of respondents	75	
No. of observations	1,350	

Robust standard errors (SE) in parentheses. Estimated coefficients reflect the preferences for cancer care service characteristics: a positive sign for a coefficient indicates that for increasing levels of an attribute, the utility increases, and vice versa. McFadden's pseudo R-squared is defined as $1-(LL_0/LL_1)$, where LL_1 is the value of the log-likelihood function for the estimated model, while LL_0 is the log-likelihood function value for the null model.

*p < 0.05; **p < 0.01

Table 4. Logit random parameters model estimates for patients' preferences regarding cancer care services

Attributes	Mean		Standard deviation	
	Coefficients	SE	Coefficients	SE
Continuity of care				
No (reference)				
Yes	7.44	(1.58)**	1.41	(1.29)
Understanding				
Low ability (reference)				
High ability	15.09	(2.89)**	10.65	(2.16)**
Information				
Not complete (reference)				
Generic	4.55	(1.42)**	5.36	(1.40)**
Detailed and complete	16.95	(3.19)**	5.36	1.40)**
Treatment choice				
The physician alone (reference)				
The patient after consulting the physician	3.07	(1.50)*	15.67	(3.15)**
The physician and the patient together	11.67	(2.57)**	15.66	(3.15)**
Time for therapy				
More than 5 hours (reference)				
Around 4-5 hours	3.92	(1.72)*	10.16	(2.58)**
Less than 4 hours	6.8	(1.90)*	7.06	(1.84)**
Log-likelihood function	-312.6363			
Info. criterion: BIC	1.06145			
McFadden's pseudo R-squared	0.332			
No. of respondents	75			
No. of observations	1,350			

Robust standard errors (SE) in parentheses. For all random coefficients, a normal distribution was used. Estimated mean coefficients reflect the preferences regarding cancer care service characteristics: a positive sign for a coefficient indicates that for increasing levels of an attribute, the utility increases, and vice versa. Estimated standard deviation coefficients reflect the heterogeneity among respondents. McFadden's pseudo R-squared is defined as $1-(LL_0/LL_1)$, where LL_1 is the value of the log-likelihood function for the estimated model, while LL_0 is the log-likelihood function value for the conditional logit model without random parameters.

*p < 0.05; **p < 0.01

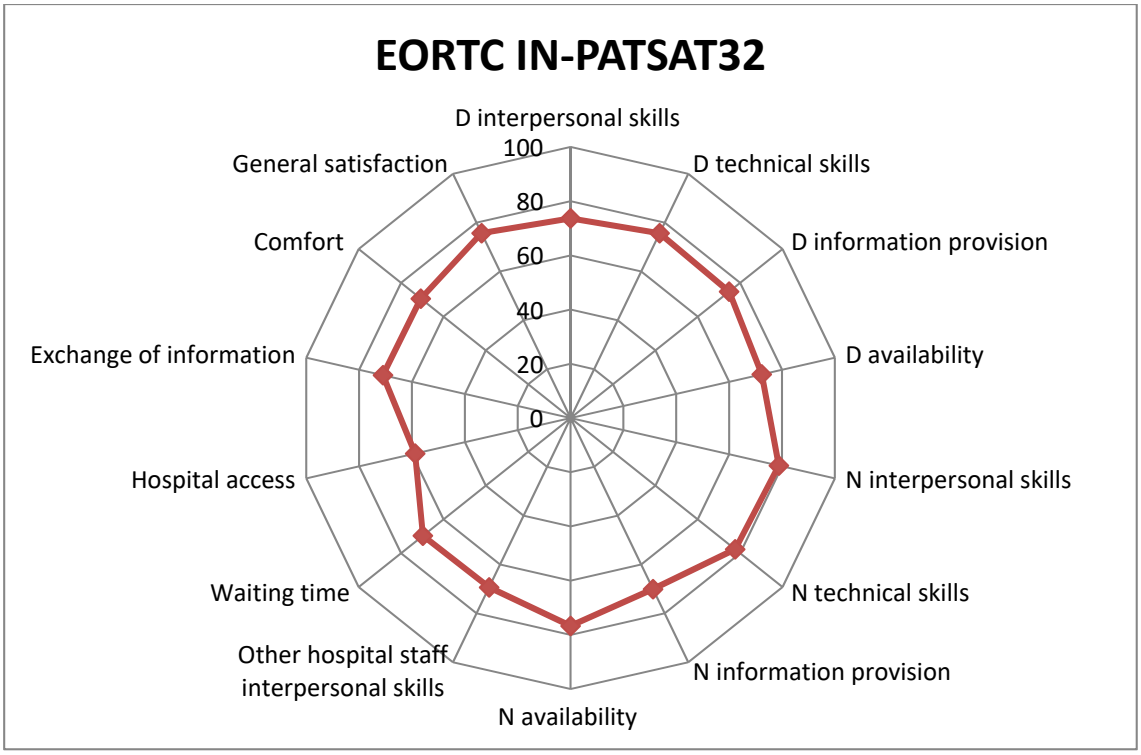
Table 5. Conditional logit model estimates of patients' preferences regarding cancer care services stratified by IN-PATSAT32 general satisfaction score (lower/upper median value)

	General satisfaction ≤ 75		General satisfaction > 75	
Attributes	**Coefficients**	**SE**	**Coefficients**	**SE**
Continuity of care				
No (reference)				
Yes	0.59	(0.19)**	0.54	(0.22)
Interpersonal skills				
Low ability (reference)				
High ability	1.13	(0.22)**	0.90	(0.17)**
Information				
Not complete (reference)				
Generic	0.35	(0.21)	0.25	(0.28)
Detailed and complete	1.34	(0.20)**	1.02	(0.25)**
Treatment choice				
The physician alone (reference)				
The patient after consulting the physician	0.32	(0.23)	0.33	(0.21)
The physician and the patient together	0.94	(0.25)**	0.73	(0.27)**
Time for therapy				
More than 5 hours (reference)				
Around 4-5 hours	0.45	(0.20)*	-0.12	(0.26)
Less than 4 hours	0.64	(0.17)**	-0.07	(0.28)
Log-likelihood function	-195.13		-123.75	
Info. criterion: BIC	0.995		1.244	
McFadden's pseudo R-squared	0.358		0.230	
No. of respondents	49		26	
No. of observations	882		468	

Robust standard errors (SE) in parentheses. Estimated coefficients reflect the preferences regarding cancer care service characteristics: a positive sign for a coefficient indicates that for increasing levels of an attribute, the utility increases, and vice versa.

*p < 0.05; **p < 0.01

Figure 2. Mean value of EORTC IN-PATSAT32 subscale scores (0 indicates lack of satisfaction and 100 indicates maximum satisfaction).



D identifies scales referring to doctors and N identifies scales referring to nurses.

Appendix1.

Table A1. Patients' characteristics by response to DCE (N=142).

	Responders (N=75)	**Not responders (N=67)**
Characteristics	**N %**	**N %**
Age*, mean years (SD)	61.6 (10.6)	67.8 (8.5)
≥ 65 years	34 45.3	41 55.7
Gender: male	39 52.0	39 58.2
Education level*: High school or degree	38 50.7	19 28.4
Living with partner	48 64.0	45 67.2
Type of cancer:		
Colon	44 58.7	37 55.2
Rectum	31 41.3	30 44.8
Cancer stage: III or IV	50 74.6	62 82.7
IN-PATSAT32 doctors'scales, mean years (SD)		
technical skills	75.7 (19.4)	79.5 (21.1)
interpersonal skills	73.7 (23.0)	74.9 (22.9)
information provision	74.8 (23.5)	76.1 (22.5)
availability	72.3 (23.9)	76.3 (21.9)
IN-PATSAT32 nurses'scales, mean years (SD)		
technical skills	77.7 (18.2)	77.4 (22.9)
interpersonal skills	78.8 (19.0)	77.6 (21.7)
information provision	70.0 (25.2)	65.5 (33.5)
availability	76.7 (21.5)	76.2 (22.4)
IN-PATSAT32 hospital scales, mean years (SD)		
Other hospital staff interpersonal skills	69.3 (22.3)	78.4 (21.3)
Waiting time	69.7 (23.5)	74.8 (20.9)
Hospital access	58.8 (26.1)	61.7 (25.5)
Exchange information	71.0 (23.6)	72.7 (26.4)
Hospital comfort	70.7 (21.1)	72.3 (25.0)
General satisfaction	75.7 (20.5)	81.0 (20.5)

SD Standard Deviation;

* indicates differences statistically significant at p value<0.05 (wilcoxon test for continuous variable; Fisher exact test for categorical variable)

Table A2. Patients' characteristics by stage of disease among respondents to the DCE (N=75).

	Stage I-II (N=13)		**Stage III-IV (N=62)**	
Characteristics	**N**	**%**	**N**	**%**
Age, mean years (SD)	64.4	(8.5)	60.8	(10.9)
≥ 65 years	9	69.2	25	40.3
Gender: male	8	61.5	31	50.0
Education level: High school or degree	7	53.8	31	50.0
Living with partner	11	84.6	37	54.7
Type of cancer:				
Colon	8	38.5	26	41.9
Rectum	5	61.5	36	58.1
IN-PATSAT32 doctors'scales, mean years (SD)				
technical skills	75.0	(20.7)	75.8	(19.3)
interpersonal skills	77.6	(22.7)	72.8	(23.2)
information provision	76.9	(22.6)	74.3	(23.8)
availability	76.0	(23.6)	71.6	(24.1)
IN-PATSAT32 nurses'scales, mean years (SD)				
technical skills	75.6	(18.5)	78.1	(18.2)
interpersonal skills	76.3	(18.3)	79.3	(19.2)
information provision	73.7	(26.1)	69.3	(25.1)
availability	75.0	(22.8)	77.0	(21.4)
IN-PATSAT32 hospital scales, mean years (SD)				
Other hospital staff interpersonal skills	69.2	(26.9)	69.4	(21.4)
Waiting time	71.2	(28.6)	69.4	(22.5)
Hospital access	46.2	(25.2)	61.5	(25.6)
Exchange information	75.0	(22.8)	70.2	(23.9)
Hospital comfort	75.0	(22.8)	69.8	(20.8)
General satisfaction	75.0	(22.8)	75.8	(20.2)

SD Standard Deviation;

Table A3. Patients' characteristics by cancer site among respondents to the DCE (N=75).

	Rectum (N=31)	**Colon (N=44)**
Characteristics	**N %**	**N %**
Age, mean years (SD)	61.2 (8.9)	61.9 (11.7)
≥ 65 years	11 35.5	23 52.3
Gender: male	14 45.2	25 56.8
Education level: High school or degree	15 48.4	23 52.3
Living with partner	17 54.8	31 70.4
Stage: III or IV	26 83.9	36 81.2
IN-PATSAT32 doctors'scales, mean years (SD)		
technical skills	73.7 (19.4)	77.1 (19.5)
interpersonal skills	74.2 (21.4)	73.3 (24.3)
information provision	77.2 (22.1)	73.1 (24.4)
availability	72.2 (21.1)	72.4 (25.9)
IN-PATSAT32 nurses'scales, mean years (SD)		
technical skills	75.0 (17.5)	79.5 (18.6)
interpersonal skills	78.0 (16.3)	79.4 (20.8)
information provision	68.9 (19.9)	70.8 (28.5)
availability	74.7 (22.2)	78.1 (21.1)
IN-PATSAT32 hospital scales, mean years (SD)		
Other hospital staff interpersonal skills	67.2 (20.2)	70.8 (23.7)
Waiting time*	61.7 (23.0)	75.3 (22.3)
Hospital access	54.8 (27.5)	61.6 (24.9)
Exchange information	69.4 (20.1)	72.2 (26.0)
Hospital comfort	66.9 (20.8)	73.3 (21.2)
General satisfaction	71.8 (20.2)	78.4 (20.6)

SD Standard Deviation;

* indicates differences statistically significant at p value<0.05 (Wilcoxon test for continuous variable; Fisher exact test for categorical variable)