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ORIGINAL ARTICLE

The association between patients' perceived continuity of care and beliefs about oral anticancer treatment

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Abstract

Purpose To explore factors associated with necessity beliefs and concerns among patients receiving oral anticancer therapy (OACT) and, specifically, to examine the relationship between continuity of care (COC) and patients' beliefs about OACT.

Methods A cross-sectional study was conducted among patients from four oncology centers receiving OACT (either targeted, hormonal, or chemotherapy). Two months after OACT initiation, patients were asked to participate in a face-to-face or telephone survey. The Beliefs about Medicines Questionnaire was used to examine patients' perceptions of their personal necessity for OACT and concerns about potential adverse effects. The Nijmegen Continuity Questionnaire was used to assess patients' perceived COC. Data on clinical characteristics were collected from medical records.

Results Participants' beliefs about OACT necessity ($n = 91$) were found to be associated with COC within the oncology team, and with COC between the oncology specialist and the primary care physicians ($\beta = 0.27$, $p = 0.003$; $\beta = 0.22$, $p = 0.02$, respectively), beyond age, depression, and cancer type ($\Delta R^2 = 0.14$, $p < 0.001$). Additionally, the difference between participants' beliefs about OACT necessity and their OACT-related concerns was associated with COC within the oncology team ($\beta = 0.30$, $p = 0.001$), beyond age, income, family status, and cancer type ($\Delta R^2 = 0.09$, $p = 0.001$).

Conclusions This study shows that cancer patients' perceptions about the COC between care providers are related to their beliefs about OACT necessity, thus providing evidence for the importance of health care delivery approaches that support COC within the oncology team and between the oncology specialist and the primary care physician.

Keywords Oral anticancer treatment · Continuity of care · Beliefs about Medicines Questionnaire · Nijmegen Continuity Questionnaire

Introduction

The gradual increase in the number of patients receiving oral anticancer therapy (OACT) changes how cancer treatment is delivered [1]. While OACT may offer patients greater autonomy and interfere less with everyday life [2, 3], it poses challenges of adherence to treatment, which were of little concern to health care providers (HCPs) before its vast use [4]. Unlike traditional intravenous therapy, OACT is taken at home, under the management of patients and caregivers who face treatment-related issues such as regimen complexity, prescription refilling, and the occurrence of side effects which may challenge OACT adherence. Additionally, lack of communication and collaboration between the different HCPs involved in the delivery of OACT, whether within the oncology team or across physician specialties (between the oncology specialist [OS] and the primary care physician [PCP]), may impair adherence to treatment because of unclear and controversial

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treatment instructions, patient anxiety, dissatisfaction, and loss of confidence in HCPs and in the treatment itself [5].

Suboptimal adherence to OACT may lead to disease progression and increased risk for death [6, 7]. Adherence to OACT is influenced by many factors related to the patient, the disease, the treatment, and the health care system [8, 9]. A recently published systematic review among breast cancer patients found that one of the most commonly reported psychosocial factors that is positively associated with adherence to OACT was patients' beliefs in the importance and benefit of therapy [10].

The beliefs-about-medicines framework is derived from social cognition models, such as the health beliefs model and the theory of planned behavior [11], which assume that individuals' beliefs about their medicines influence their interpretation of information and experiences and guide their medication-taking behavior [12]. Medicine-related beliefs influence mainly intentional non-adherence (when patients decide to take medications in a different way than prescribed because of beliefs and preferences) but also unintentional non-adherence (when patients fail to adhere to treatment through forgetfulness, carelessness, and reasons beyond their control) [13, 14].

Horne et al. (1999) suggested that beliefs about medicines can be grouped into "necessity beliefs" (perceptions of personal need for treatment) and "concerns" (about treatment-related adverse consequences) and that patients often engage in a cost-benefit analysis in which necessity beliefs are weighed against concerns [15]. In a 2013 meta-analysis of 94 studies that used the necessity-concerns framework to explain medication adherence, an association was found between higher adherence and stronger perception of treatment necessity and fewer concerns about treatment [16]. Similarly, another meta-analysis that investigated the necessity-concerns framework found a significant correlation between necessity and concern beliefs and medication adherence on a population level and across a vast array of illness conditions [17].

Compared with other adherence-related factors, such as sociodemographic factors, depression, and treatment-related factors, patients' beliefs about their medicines are thought to be more amenable to change [10, 18]. Understanding factors associated with patients' medication beliefs may help health professionals and organizations tailor interventions that would improve adherence to OACT. However, little is known about factors that affect beliefs about OACT. One study that examined modifiable factors of adherence among breast cancer patients found an association between beliefs in the necessity of adjuvant endocrine therapy and frequency of physician communication [19]. Indeed, continuity of care (COC), defined as the degree to which a series of discrete health care events are experienced by the patient as coherent, connected, and consistent with his or her medical needs and personal context [20], contributes to patients' trust in their physicians and hence, may promote their beliefs about the prescribed medicines [21].

COC is a multidimensional concept that consists of "personal continuity" (between a patient and one or more providers) and "team/cross-boundary continuity" (communication and collaboration between care providers to connect care, whether in the same care setting or between care settings) [22]. In the multiple HCP setting of cancer care, COC has the potential to ensure that all providers involved in treatment, as well as patients, share an understanding of the treatment benefits and its consequences [23, 24], and hence, the potential to promote positive beliefs in the necessity of prescribed medicines.

The objectives of this study were to explore factors associated with necessity beliefs and concerns among patients receiving OACT and, specifically, to examine the relationship between COC and patients' beliefs about OACT.

Methods

Study design and population

A cross-sectional study was conducted between December 2015 and October 2017 in four oncology centers in central and northern Israel, following approval by the ethics committees of the University of Haifa and each of the participating centers. Written informed consent was obtained from all study participants. Adult patients (age > 18 years) were invited to participate in the study upon receiving a first prescription for one of the following OACTs: chemotherapy (capecitabine, vinorelbine), targeted therapy (erlotinib, sunitinib, everolimus, ibrutinib, imatinib, ponatinib), hormonal therapy (abiraterone), or thalidomide and lenalidomide. These anticancer drugs are used to treat the most prevalent cancer types, including breast, colorectal, lung, prostate, and renal cancers [25], as well as some of the most common hematologic malignancies (e.g., chronic lymphocytic leukemia and multiple myeloma), and were chosen to recruit a relatively large and representative sample of cancer patients receiving OACTs. All cancer patients, with all cancer types, and in all stages of the disease who were prescribed one of the above OACTs as part of their treatment were included in the study, whether they were concomitantly receiving or had previously received any other treatments (including with other or the same oral agents, IV treatment, or radiotherapy). Patients diagnosed with cognitive deficits or unable to participate in a face-to-face or telephone interview because of language or hearing difficulties were excluded. For a medium effect size of 0.15 at alpha = 0.05, and five independent variables in the model, a sample size between 68 and 92 participants was needed to achieve a statistical power of 0.80 [26].

Approximately 2 months after OACT initiation (allowing completion of three capecitabine treatment cycles), patients were asked to participate in a 15- to 20-min face-to-face or telephone survey conducted in Hebrew. The survey questionnaire was used to collect data on patient-related factors, patients' perceived COC, and adherence-related beliefs. Data on disease- and treatment-related factors were abstracted from patients' medical charts. All surveys and data abstraction were performed by four trained individuals.

Survey questionnaire

The survey included questions about patients' sociodemographic characteristics (gender, age, country of birth, level of education, marital status, and household income according to the 2010 Israel Social Security report) [27] and an assessment of depressive symptoms using the Patient Health Questionnaire-9 (PHQ-9) [28]. Additionally, the questionnaire included the following instruments.

Beliefs about Medicines Questionnaire-specific The Beliefs about Medicines Questionnaire-specific (BMQ-S) was used to measure participants' beliefs about OACTs, as previously used by others [19, 29]. The BMQ-S comprises two 5-item Likert-type scales ranging from 1 (strongly disagree) to 5 (strongly agree): one assesses patients' beliefs about the necessity of the prescribed medication for controlling their illness (BMQ-N scale); the other assesses patients' concerns about the potential adverse consequences of taking the medication (BMQ-C scale). Item scores within each scale are summed to give a scale score ranging from 5 to 25. Additionally, for each patient, the difference between the necessity beliefs score and the concerns score (the necessity–concerns differential [BMQ-NCD]) is calculated, to reflect an individual cost-benefit perception, where patient's perceptions of cost (concerns) are weighed against the perception of benefit (necessity beliefs). A positive necessity-concerns differential reflects a patient's perception of the medication as more beneficial than costly [15]. The internal consistency (Cronbach's alpha) for the scales of the original instrument ranged from 0.65 (for the concerns scale) to 0.86 (for the necessity scale) [30].

The BMQ-S was translated into Hebrew using a forward-backward approach. The Hebrew version was further adapted to the Israeli health care system and to the context of OACT following discussions in the research group. The final version of the BMQ-S was piloted by administering the questionnaire to ten patients receiving OACT to ensure that the questions were intelligible and answerable. This process revealed no problems in understanding the items. Items and subscales description of the BMQ is provided in Appendix 1. The internal consistency (Cronbach's alpha) for the scales in the current study ranged from 0.69 (for the concerns scale) to 0.76 (for the necessity scale).

Nijmegen Continuity Questionnaire The Nijmegen Continuity Questionnaire (NCQ) is a valid and reliable generic questionnaire that measures patients' experienced COC as a multidimensional concept regardless of morbidity and care setting [22, 31]. The NCQ has two parts: the first assesses personal continuity with the care provider (eight items for the OS; eight items for the PCP); the second part assesses team/cross-boundary continuity (four items for collaboration within the oncology team; four items for collaboration between the OS and the PCP). All NCQ items are scored on a 5-point Likert scale (1 = strongly disagree; 5 = strongly agree), with an option of "I do not know" coded as 0. Total scale scores are assessed separately for each physician type (PCP/OS) and for each health care setting and calculated as the mean of the items in each scale. The translation of the NCQ into Hebrew and its adaptation to the context of OACT is discussed elsewhere [32]. Items and subscales description of the NCQ is provided in Appendix 2. Internal consistency (Cronbach's alpha) for all scales in this study ranged from 0.83 (personal continuity with the OS) to 0.96 (continuity within the oncology team).

Statistical analysis

Descriptive statistics (frequency, distribution, means, and standard deviations) were used to describe participants' demographic, personal, and clinical characteristics as well as COC, and to assess patients' overall necessity beliefs and concerns regarding OACTs. Age was treated as both a continuous variable and a dichotomous variable (divided according to the mean). Income was treated as a dichotomous variable scored as 1 if participants reported a monthly income equal or above the average monthly income according to the 2010 Israel Bureau of Statistics [27] or 0 if they reported a lower monthly income. Cancer types were grouped according to the affected body systems (breast, gastrointestinal, kidney, prostate, and hematology malignancies). PHQ-9 score was treated as both a continuous variable and a dichotomous variable according to whether participants had a PHQ-9 score ≥ 10 (considered positive for major depression) [33]. Oral anticancer drugs were grouped according to type (chemotherapy, targeted therapy, hormonal therapy, and thalidomides). Associations between dependent variables (necessity beliefs, concerns, and necessity-concerns differential) and independent variables were assessed using *t* test, one-way analysis of variance (ANOVA) (using the Tukey HSD post hoc test), or Pearson correlation. Additionally, the Kruskal–Wallis test for independent samples was used to assess the association between variables with more than two categories when assumptions for the ANOVA were not met. Hierarchical (block-wise) multiple linear regression models were used to test the association between COC between providers and necessity beliefs, concerns, or necessity-concerns differential, beyond patient-, disease-, or treatment-related variables. Variables were included in the model if in the bivariate analyses an alpha level of 0.20 or a Pearson correlation ≥ 0.3 was reached. Associations between potential predictors in the model were examined in bivariate analyses to avoid colinearity. Sociodemographic and clinical factors were included in model I, and factors related to COC between providers were added in model II. A dummy variable was used for "cancer type" based on the ANOVA results, scored as 1 for colon, gastric, or pancreas cancers or 0 for all other cancer types. Similarly, a dummy variable was used for "OACT type," scored as 1 if participants received any of the chemotherapy OACT or 0 if they received any other type of OACT. Multivariate outliers were identified using the Mahalanobis distance. Residual analyses were used to test the assumption of normality in the regressions. All analyses were performed using the SPSS version 23.0 statistical program (SPSS Inc., Chicago, IL).

Results

Ninety-seven patients participated in the study. Data retrieved from four participants (4.1%) were excluded from the analysis because of having less than 50% valid answers. Two outliers were observed in the multivariate analyses, and the data received from these participants were removed from the data set. The final sample size was 91; there were no missing data. Participants' sociodemographic and clinical characteristics are presented in Table 1. Most participants had solid tumors ($n = 77$, 84.6%) in stage III or IV ($n = 55$, 60.4%) and 14 (15.4%) had hematologic malignancies. Two-thirds ($n = 61$, 67%) received oral chemotherapy agents, 17 (18.7%) received targeted therapy, five (5.5%) received hormonal therapy (abiraterone), and eight received either lenalidomide ($n = 5$, 5.5%) or thalidomide ($n = 3$, 3.3%).

Factors associated with participants' OACT-related necessity beliefs and concerns

Overall, participants' beliefs in the necessity of OACT were higher than their OACT-related concerns (mean = 17.8 ± 3.3; mean = 14.7 ± 3.7, respectively; $p < 0.001$). This finding was also reflected in a positive mean value of 3.1 ± 4.4 for the necessity-concerns differential. Table 2 presents the association between patient-, disease-, and treatment-related factors and beliefs about OACT in the bivariate analysis. In general, younger patients perceived OACT as more beneficial than costly compared with older patients (mean BMQ-NCD = 4.1 ± 4.5 vs. 2.0 ± 4.1, $p < 0.05$). Participants with an average or above-average income and participants who were married or in a committed relationship, had less OACT-related concerns than all other participants (mean BMQ-C = 13.4 ± 3.5 vs. 15.2 ± 3.7; mean BMQ-C = 14.3 ± 3.6 vs. 16.4 ± 4,

Table 1 Participants' personal and clinical characteristics ($n = 91$)

Characteristics	
Age years mean (SD)	62.0 (12.2)
Gender: female *n* (%)	51 (56.0)
Family status: married or in a committed relationship *n* (%)	75 (82.4)
Academic or other higher education *n* (%)	58 (63.7)
Household income (average or above) *n* (%)	28 (30.8)
Having chronic medical conditions other than cancer *n* (%)	59 (64.8)
Cancer type *n* (%)	
Colorectal$	28 (30.8)
Gastric$	6 (6.6)
Pancreas$	3 (3.3)
Breast	28 (30.8)
Prostate	5 (5.5)
Kidney	4 (4.4)
Lung	3 (3.3)
Multiple myeloma#	8 (8.8)
Chronic Lymphocytic Leukemia (CLL)#	3 (3.3)
Chronic Myelocytic Leukemia (CML)#	3 (3.3)
Oral anticancer medication *n* (%)	
Capecitabine†	51 (56.0)
Vinorelbine†	10 (11.0)
Abiraterone‡	5 (5.5)
Everolimus§	5 (5.5)
Sunitinib§	5 (5.5)
Erlotinib§	1 (1.1)
Ibrutinib§	3 (3.3)
Imatinib§	2 (2.2)
Ponatinib§	1 (1.1)
Lenalidomide£	5 (5.5)
Thalidomide£	3 (3.3)
Cancer stage (for solid tumors only) *n* (%)	
Stage 1	5 (5.4)
Stage 2	18 (19. 6)
Stage 3	20 (21.7)
Stage 4/metastatic disease	35 (38.5)
Patient Health Questionnaire-9 (PHQ-9) ≥ 10 *n* (%)	26 (28.6)

$ Gastrointestinal cancer: colorectal, gastric, esophageal, and pancreatic carcinomas

Hematologic malignancy: multiple myeloma, chronic lymphocytic leukemia (CLL), chronic myelocytic leukemia (CML)

† Chemotherapy agents: capecitabine, vinorelbine

§ Targeted therapy agents: everolimus, sunitinib, erlotinib, ibrutinib, imatinib, ponatinib

‡ Hormonal therapy: abiraterone

£ Thalidomides: lenalidomide, thalidomide

Table 2 Association between patient-, disease-, and treatment-related factors and beliefs about oral anticancer therapy (bivariate analyses)

Factors	Necessity beliefs (BMQ-N) mean (SD)	Concerns (BMQ-C) mean (SD)	Necessity-concerns differential (BMQ-NCD) mean (SD)
Patient-related factors			
Age *(n)*			
≤ 62 years (46)	18.2 (2.9)	14.1 (3.3)	4.1 (4.5)
> 62 years (45)	17.3 (3.5)	15.3 (4.1)	2.0 (4.1)
p value	0.19	0.13	0.02
Gender *(n)*			
Female (51)	18.3 (2.9)	15.0 (3.5)	3.2(4.1)
Male (40)	17.2 (3.6)	14.2 (4.0)	3.0 (4.9)
p value	0.11	0.29	0.78
Family status *(n)*			
Married (75)	18.0 (3.1)	14.3 (3.6)	3.7 (4.5)
Not married (16)	16.8 (3.8)	16.4 (4.1)	0.4 (3.1)
p value	0.20	0.04	0.01
Income *(n)*			
Average and above (28)	17.9 (3.0)	13.4 (3.5)	4.5 (4.4)
Below average (63)	17.7 (3.4)	15.2 (3.7)	2.5 (4.3)
p value	0.76	0.03	0.04
Depression *(n)*			
PHQ-9 score ≥ 10 (26)	18.6 (2.9)	14.8 (4.7)	3.8 (4.3)
PHQ-9 score < 10 (65)	17.4(3.6)	14.6 (3.3)	2.8 (4.5)
p value	0.14	0.89	0.34
Disease-related factors			
Cancer type *(n)*			
Kidney (4)	22.7 (2.2)	17.3 (5.6)	5.5 (3.9)
Hematologic malignancies (14)	19.8 (2.9)	14.3 (4.7)	5.5 (6.1)
Breast (28)	18.3 (2.2)	14.4 (3.4)	4.0 (3.7)
Prostate (5)	18.4 (2.1)	13.4 (4.8)	5.0 (3.3)
Lung (3)	16.7 (3.2)	17.0 (3.0)	−0.3 (4.0)
Gastrointestinal (37)	16.1 (3.3)	14.8 (3.3)	1.3 (3.7)
p value[$]	< 0.001	0.86	0.001
Stage of the disease[#] *(n)*			
Stage 4/metastatic disease (35)	18.1 (2.7)	15.4 (4.3)	2.7 (4.3)
All other stages (42)	17.0 (3.7)	14.2 (2.8)	2.8 (4.0)
p value	0.13	0.16	0.94
Medication-related factors			
OACT type *(n)*			
Thalidomides (8)	20.3 (3.7)	14.3 (6.0)	6.0 (8.0)
Targeted therapy agents (17)	19.9 (2.3)	15.9 (3.8)	4.0 (3.6)
Hormonal therapy agents (5)	18.4 (2.1)	13.4 (4.8)	5.0 (3.3)
Chemotherapy agents (61)	16.8 (3.1)	14.5 (3.3)	2.3 (3.9)
p value[†]	< 0.001	0.52	0.015

[#] For solid tumors only

[$] For gastrointestinal cancer vs. all other cancer types

[†] For chemotherapy vs. all other OACT types

Table 3 Association between health care delivery–related factors and beliefs about oral anticancer therapy (bivariate analyses)

Factors	Necessity beliefs (BMQ-N)	Concerns (BMQ-C)	Necessity-concerns differential (BMQ-NCD)
Medical center (*n*)	Mean (SD)	Mean (SD)	Mean (SD)
1 (23)	18.6 (2.7)	15.5 (4.5)	3.1 (4.1)
2 (15)	17.4 (3.2)	14.2 (2.4)	3.2 (3.7)
3 (30)	18.6 (3.3)	14.1 (3.7)	4.5 (4.9)
4 (23)	16.1 (3.3)	15.0 (3.7)	1.2 (4.1)
p value	0.02	0.53	0.06
Personal continuity with care provider (*r*)			
Personal continuity with PCP	0.12	− 0.09	0.16
p value	0.27	0.41	0.13
Personal continuity with OS	0.21	0.00	0.15
p value	0.05	0.97	0.16
Team/cross-boundary continuity (*r*)			
Continuity within the oncology team	0.38	− 0.1	0.40
p value	< 0.001	0.40	< 0.001
Continuity between OS and PCP	0.32	− 0.14	0.29
p value	0.002	0.56	0.005

OS, oncology specialist; *PCP*, primary care physician

respectively; $p < 0.05$ for all), as well as greater necessity-concerns differentials (mean BMQ-NCD = 3.7 ± 4.5 vs. 0.4 ± 3.1; mean BMQ-NCD = 4.5 ± 4.4 vs. 2.5 ± 4.3, respectively; $p < 0.05$ for all). Cancer type and type of OACT were associated with patients' beliefs in the necessity of OACT ($F(5) = 6.97$, $p < 0.001$; $F(3) = 6.98$, $p < 0.001$, respectively). Participants with a gastrointestinal malignancy had weaker beliefs in the necessity of OACT compared with all other participants (mean BMQ-N = 16.1 ± 3.3 vs. 18.9 ± 2.7, $p < 0.001$) and compared with participants with breast carcinoma (mean difference in BMQ-N score = − 2.3 ± 0.7, $p = 0.02$), renal cell carcinoma (mean difference in BMQ-N score = − 6.7 ± 1.5, $p < 0.001$), or hematologic malignancy (mean difference in BMQ-N score = − 3.7 ± 0.9, $p = 0.001$). Similarly, participants receiving chemotherapy agents had weaker beliefs in the necessity of OACT compared with all other participants (mean BMQ-*N* = 16.6 ± 3.1vs.19.3 ± 2.8, $p < 0.001$) and compared with participants receiving either targeted therapies (mean difference in BMQ-N score = − 3.1 ± 0.8, $p = 0.002$) or thalidomides (mean difference in BMQ-N score = − 3.4 ± 1.1, $p = 0.015$). Female participants, participants with depression, and participants with metastatic disease had stronger beliefs about the necessity of OACT; however, these associations were not statistically significant (Table 2).

Table 3 presents the association between health care delivery–related factors including patients' perceived COC and beliefs about OACT. Participants recruited from different medical centers differed in their beliefs about OACT necessity ($F(2) = 3.33$, $p = 0.02$). Personal continuity with the PCP or with the OS had low or non-significant correlations with beliefs about OACT (Table 3). However, COC within the oncology team, and COC between the OS and the PCP, had significant correlations with beliefs in the necessity of OACT ($r = 0.38$, $r = 0.32$, respectively; $p < 0.01$ for all) and with the necessity-concern differential ($r = 0.40$, $r = 0.29$, respectively; $p < 0.01$ for all) but not with concerns about OACT ($r = -0.01$, $p = 0.89$; $r = -0.06$, $p = 0.56$, respectively).

The association between COC between providers and patients' beliefs about OACT

Table 4 presents the results of the hierarchical multiple regression analysis examining the association between team/cross-boundary COC and beliefs about OACT necessity and the necessity-concerns differential. A similar analysis was not performed for "concerns about OACT" as the dependent variable because it was not associated with COC in the bivariate analysis. Additionally, the variable "medical center" was not included in the regression models because of its significant association with "COC within the oncology team" as well as with "COC between the PCP and the OS" ($p = 0.035$, $p < 0.001$, respectively; Kruskal–Wallis test).

The variables "age," "PHQ-9 score," and "cancer type" included in model I to predict "necessity beliefs" explained 20% of the variance. "Gender" and "stage of the disease" were not included in the model because of their statically significant

Table 4 Hierarchical multiple regression analyses examining the association between continuity of care between providers and beliefs about oral anticancer therapy

Predictors	Dependent variable					
	Necessity beliefs (BMQ-N)			Necessity–concerns differential (BMQ-NCD)		
	B	SE	*β*	*B*	SE	*β*
Model I						
Age	− 0.03	0.03	− 0.1	− 0.06	0.03	− 0.17
Income (1 = average or above; 0 = below average)	–	–	–	2.0	0.89	0.21*
Family status (1 = married or in a relationship; 0 = all other)	–	–	–	2.83	1.09	0.24*
PHQ-9 score (1 = PHQ-9 ≥ 10; 0 = PHQ-9 < 10)	− 0.02	0.74	0.002	–	–	–
Cancer type (1 = GI cancer; 0 = all other)	− 2.91	0.67	− 0.44***	−3.0	0.83	−0.33**
R^2	0.20			0.26		
F	7.25***			7.51***		
Model II						
Age	− 0.01	0.02	− 0.04	− 0.06	0.03	− 0.15
Income (1 = average or above; 0 = below average)	–	–	–	1.57	0.85	0.16
Family status (1 = married or in a relationship; 0 = all other)	–	–	–	2.57	1.03	0.22*
PHQ-9 score (1 = PHQ-9 ≥ 10; 0 = PHQ-9 < 10)	0.225	0.68	0.03	–	–	–
Cancer type (1 = GI cancer; 0 = all other)	− 2.50	0.63	− 0.37**	− 2.63	0.79	− 0.29**
Continuity within oncology team	0.49	0.16	0.27**	0.73	0.22	0.30**
Continuity between OS and PCP	0.53	0.22	0.22*	–	–	–
R^2	0.34			0.35		
F	8.92***			9.0***		
R^2 change	0.14			0.09		
F change	9.34***			11.3**		

OS = oncology specialist; PCP = primary care physician; *$p < .05$; **$p < .01$; ***$p < .001$

association with "cancer type" ($\chi^2 = 8.4$, $p = 0.004$; $\chi^2 = 15.6$, $p = 0.001$, respectively). The variables "age," "income," "family status," and "cancer type" included in model I to predict the "necessity-concern differential" explained 26% of the variance.

As shown in Table 4, COC between providers (within the oncology team and between the PCP and the OS) predicted participants' beliefs about the necessity of OACT beyond age, depression, or cancer type, explaining an additional 14% of the variance in necessity beliefs. Moreover, COC between providers within the oncology team predicted the necessity-concerns differential beyond age, income, family status, and cancer type, explaining an additional 9% of the variance in the necessity-concerns differential.

As "cancer type" and "OACT type" were significantly associated ($\chi 2 = 21.4$, $p < 0.001$), they could be included interchangeably in both regression analyses. Performing the regression analyses while including "OACT type" instead of "cancer type" yielded similar results ($\Delta R^2 = 0.17$, $\Delta F(2,85) = 11.7$, $p < 0.001$, for the association between COC between providers and beliefs about OACT necessity; $\Delta R^2 = 0.13$, $\Delta F(1,86) = 14.7$, $p < 0.001$, for the association between COC between providers and the necessity-concerns differential).

Discussion

The purpose of this study was to explore factors associated with necessity beliefs and concerns among patients receiving OACT and, particularly, to examine the relationship between COC and patients' beliefs about OACT. To the best of our knowledge, this is the first study of its kind to assess correlates of medication beliefs and to explore the role of COC in the context of OACT. The results show that the necessity-concern framework is associated with sociodemographic factors (age, gender, family status, and income), disease-related factors (depression, cancer type, and cancer stage), treatment-related factors (OACT type), and health care delivery–related factors (COC between providers within the oncology team and between the OS and the PCP). Moreover, COC between providers was found to be a strong correlate of patients' beliefs in the necessity of OACT and of patients' "cost-benefit" perceptions of OACT, accounting for 14% of the variance in the necessity beliefs and 9% of the variance in the necessity-concern differential.

These results are encouraging, as COC, unlike personal- and clinical-related factors that are generally not easily amenable to change (e.g., income or depression), or not at all amenable to change (e.g., cancer type and age), can be influenced through the adoption of organizational models which emphasize the integration of care between different providers involved in cancer care delivery [34]. For example, conducting regular multidisciplinary case conferences to share information between providers within the oncology team was found to improve patients' perceptions of COC [35]. Additionally, shared care programs that involve the PCP in cancer care had a positive influence on patients' perceived COC [36].

Factors associated with beliefs about OACT in this study such as age, family status, and socioeconomic status have also been shown in other studies to be associated with adherence to OACT [8, 9]. Although adherence to OACT was not examined in the current study, it may imply that these factors together with COC influence adherence by shaping patients' beliefs about OACT [19]. Nonetheless, such a potential mediating effect should be investigated in future research.

Several limitations should be noted. The study was conducted in Israel, which may limit the applicability of the results to other settings because of differences in health care systems and cultures. Additionally, the relatively small sample size limited the number of factors that could be explored in association with beliefs about OACT and may impair the generalizability of the study findings to other cancer types and OACTs. Nonetheless, recruitment in this population of patients is challenging due to advanced stage of the disease, and high rates of depression. Prior studies, which explored adherence-related beliefs among patients receiving OACT, included similar sample sizes [29, 37].

However, this multicenter study, performed among a diverse group of cancer patients, provides unique evidence for the role of health care delivery and COC in patients' beliefs about OACT and for the importance of collaboration between providers in the multi-provider setting of OACT.

This study shows that with the advent of OACT, health care organizations should focus on improving communication and collaboration among the various providers caring for cancer patients to positively impact on patients' beliefs about OACT.

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Compliance with ethical standards

Conflict of interest The authors declare that they have no conflicts of interests.

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