Patients Prioritize a Low-volume Bowel Preparation in Colitis-associated Colorectal Cancer Surveillance: A Discrete Choice Experiment

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Abbreviations: CD, Crohn's disease; CRC, colorectal cancer; CRN, colorectal neoplasia; DCE, discrete choice experiment; IBD, inflammatory bowel disease; IBD-U, IBD-unclassified; IQR, interquartile range; ISPOR, International Society for Pharmacoeconomics Outcomes Research; L, liter; LCA, latent class analysis; PEG, polyethylene glycol; PSC, primary sclerosing cholangitis; SD, standard deviation; UC, ulcerative colitis

Background: Patients with inflammatory bowel disease (IBD) undergo surveillance colonoscopies at fixed intervals to reduce the risk of colorectal cancer (CRC). Taking patients' preferences for determining surveillance strategies into account could improve adherence and patient satisfaction. This study aimed to determine patient preferences for CRC surveillance in IBD.

Methods: We conducted a web-based, multicenter, discrete choice experiment among adult IBD patients with an indication for surveillance. Individuals were repeatedly asked to choose between 3 hypothetical surveillance scenarios. The choice tasks were based on bowel preparation (0.3-4 L), CRC risk reduction (8% to 1%-6%), and interval (1-10 years). Attribute importance scores, trade-offs, and willingness to participate were calculated using a multinomial logit model. Latent class analysis was used to identify subgroups with similar preferences.

Results: In total, 310 of 386 sent out questionnaires were completed and included in the study. Bowel preparation was prioritized (attribute importance score 40.5%) over surveillance interval and CRC risk reduction (31.1% and 28.4%, respectively). Maximal CRC risk reduction, low-volume bowel preparation (0.3 L laxative with 2 L clear liquid) with 2-year surveillance was the most preferred combination. Three subgroups were identified: a "surveillance avoidant," "CRC risk avoidant," and "surveillance preferring" groups. Membership was correlated with age, educational level, perceived CRC risk, the burden of bowel preparation, and colonoscopies.

Conclusions: Inflammatory bowel disease patients consider bowel preparation as the most important element in acceptance of CRC surveillance. Heterogeneity in preferences was explained by 3 latent subgroups. These findings may help to develop an individualized endoscopic surveillance strategy in IBD patients.

Key Words: screening, risk perception, ulcerative colitis, Crohn's disease

Introduction

Patients with inflammatory bowel disease (IBD) are at an increased risk of colorectal cancer (CRC).[1,2] To detect dysplasia or early-stage CRC, international guidelines recommend that patients with long-standing colonic IBD enter a surveillance program. Current guidelines assign patients to risk categories and thereby to surveillance intervals ranging from 1 to 5 years.[3,4] However, the lengths of these surveillance intervals are based on limited evidence, and patient preferences and willingness to participate are not taken into account.

The role of the patients' perspectives with regard to balancing benefits and risks of treatment decisions has gained more attention in daily IBD practice.[5,6] Incorporation of patient preferences regarding the most important aspects of CRC surveillance could result in improved adherence and treatment satisfaction.[6,7] Previous research has shown that nonadherence to surveillance in IBD is associated with an increased risk of interval CRCs.[8] The most important reasons for patient self-reported nonadherence to CRC surveillance are issues related to bowel preparation and logistics (amongst others scheduling of the colonoscopy).[9] Still, most IBD pa-

tients accept current surveillance intervals, with up to 50% of patients even willing to undergo annual CRC surveillance.[10] To date, no study has explored the trade-offs IBD patients are willing to make regarding surveillance. Discrete choice experiments (DCEs) enable quantification of patients' preferences, trade-offs, and willingness to participate, including assessment of subgroups with comparable preferences.[11–13] Patient characteristics may impact preferences and therefore clinical decision-making, as previously shown in studies exploring shared-decision-making for medication in IBD.[13]

This study aims to quantify patients' preferences concerning CRC surveillance in IBD, making use of a DCE.

Materials and Methods

We conducted a cross-sectional, web-based, multicenter, DCE survey in 2 academic hospitals and 1 large regional hospital in the Netherlands. The study was registered in the Netherlands Trial Register (NL8300). We followed the International Society for Pharmacoeconomics Outcomes Research (ISPOR) best practice guidelines for DCE development and analysis.[11]

Study Population

Patients were recruited from February 2020 through February 2021 based on attendance at the endoscopy unit or outpatient department in consecutive and random order (Supplementary Data 1). The inclusion criteria comprised a diagnosis of IBD (Crohn's disease (CD), ulcerative colitis (UC), IBD-unclassified (IBD-U), age of 18 years or older, eligibility for CRC surveillance according to the Dutch guidelines (based on the ECCO guideline, Supplementary Data 2),[4] and informed consent. The exclusion criterion was insufficient proficiency in the Dutch language.

Sample Size

Sample size calculations for DCEs depend on the weight of preferences, which are unknown upfront.[11, 14] To assure sufficient power, we aimed to include over 300 patients.

Discrete Choice Experiment

A DCE can determine patient preferences on health care interventions and correlate these to certain patient and disease characteristics.[11,15] This technique relies on the random utility theory, which supposes that individuals value an intervention based on its attributes (eg, surveillance frequency) and subsequent levels of the attributes (eg, annual or 3-year interval). Individuals are expected to prefer the intervention with the highest relative value when offered multiple choices. The attributes and levels are processed in choice tasks, in which each choice consists of different hypothetical attribute-level combinations. An example of a choice task is provided in Supplementary Data 3.

The questionnaire, written in language level B1, was sent electronically. In case of nonresponse, a reminder was sent. The first part of the questionnaire contained questions regarding perceived disease burden (1-item Likert scale 1-10), endoscopy burden, the burden of bowel preparation (both measured using a 1-item Likert scale 1-5), perceived CRC risk (compared with the general population), family history of CRC, knowing someone affected by CRC, and level of education. Questions were based on expert opinion and discussed in the focus groups for understanding and relevance. The actual DCE started with an introduction text on CRC surveillance and the attributes. It was clarified that all offered choice tasks were hypothetical and did not reflect individual participants' actual CRC risk. In addition, it was emphasized that we assumed that the different bowel preparation regimens would result in sufficient bowel preparation quality. After the DCE, patients completed a self-reported questionnaire evaluation and the reason for undergoing surveillance at their preferred interval. In addition, baseline and disease characteristics were gathered from electronic health records.

Attributes and Associated Levels

Attributes and levels were selected based on literature review, expert interviews, and 2 focus groups with participants fulfilling the study selection criteria (n = 17 in total). The 3 most valued attributes by the focus group participants were included in the final DCE: surveillance interval, volume of bowel preparation, and CRC risk reduction (Table 1). For surveillance interval, levels were based on present Dutch guidelines,[16] with the addition of a hypothetical interval of 10 years. For bowel preparation levels, alternatives used in clinical practice were employed. Lifetime absolute CRC risk reduction levels were based on a combination of literature and expert opinion and were illustrated graphically in the DCE.[1, 2, 17]

Discrete Choice Experiment Design

A balanced overlap design was used for efficient assessment of preferences.[18] Each patient filled out 12 choice tasks consisting of 3 different (hypothetical) surveillance strategies in total. Two choice tasks contained fixed questions (1 practice and 1 dominance task with a less favorable option which is not expected to be chosen). After each task, patients were asked if they would accept this choice in real life (dual-response none question), so as to evaluate real-world preferences of the given choice task. The number of questionnaire versions was limited to 10 for practical reasons, leading to a valid design.[15,19] We refer to Supplementary Data 4 for a more detailed description of the methods used to create the DCE.

Validity

Overall response rate, task nonattendance (eg, preferring choice 1 in all choice tasks, possibly resulting from not considering the alternatives), and attribute dominance (present if no

Table 1. Final attributes and levels.

Attribute	Levels
Surveillance interval	1 year
	2 years
	3 years
	5 years
	10 years
Bowel preparation	4 L laxatives
	2 L laxatives + 1 L clear liquid
	1 L laxatives + 1 L clear liquid
	0.3 L laxatives + 2 L clear liquid
CRC risk reduction (including graphical illustration)	From 8% to 6%
	From 8% to 4%
	From 8% to 2%
	From 8% to 1%

trade-offs are made between the different attributes and levels) were assessed. The general understanding was determined with the dominance task, containing 1 less favorable choice not expected to be chosen, and the in self-reported questionnaire evaluations.[20]

Statistical Analysis

Descriptive statistics were used to summarize patient and disease characteristics. For continuous data, a mean (± standard deviation [SD]) or median (interquartile range [IQR]) was calculated. Frequencies were calculated for categorical variables.

Choice data were analyzed using a multinomial logit model to determine part-worth utility scores and attribute importance scores (making use of effects coding).[21] Part-worth utility scores for levels of each attribute represent a measure for relative desirability (or worth), grouped around 0, with higher scores implying a stronger preference. Attribute importance scores, based on the difference between most and least preferred level within 1 attribute, enable comparisons between attributes included in the DCE. A sensitivity analysis was performed excluding patients that failed the validity checks.

Latent class analysis (LCA) was used to examine preference heterogeneity through the identification of subgroups. Predictors for class membership were determined with a multinomial logit model; characteristics with a P value < .10 in univariable analysis were evaluated in a multivariable model.

Expected willingness to participate was calculated for different surveillance scenarios, making use of a previously developed method.[12] Last, trade-offs between the 3 attributes were calculated. Additional information on statistical analyses of choice data is provided in Supplementary Data 4. Choice data were analyzed using Lighthouse Studio version 9.8.0 (Sawtooth Software, North Orem, UT, USA). R statistical software (nett package), version 3.6.1, was used for all other analyses.

Ethical Considerations

The institutional review boards assessed the study as not subject to the Medical Research Involving Human Subjects Act. All patients provided informed consent.

Results

Study Population

In total, 383 eligible patients received the questionnaire and 315 patients completed the questionnaire (response rate, 82.2%). Five patients were excluded (2 screen failures, 3 other reasons), resulting in 310 included patients (Supplementary Data 1). The most important reason for participation in surveillance was CRC risk reduction for 179 patients (57.7%) and evaluation of disease activity for 104 patients (33.5%). None of the included patients had previously experienced colonoscopy-related complications, such as postprocedural bleeding or perforation. Baseline characteristics and summary data of part 1 of the questionnaire are presented in Table 2.

DCE Results

Completing the questionnaire was appraised as "no problem" by 230 respondents (74.2%). Seventy-three respondents (23.5%) commented that the questionnaire posed

Table 2. Baseline characteristics.

Characteristics	Total cohort n = 310
Baseline characteristics	
Age at inclusion, median (IQR)	53.4 (40.8–63.2)
Age at IBD diagnosis, median (IQR)	28.6 (21.2–39.8)
IBD disease duration, median (IQR)	17.5 (12.1–28.2)
Female sex, n (%)	174 (56)
IBD type, n (%)	
UC	151 (49)
CD	151 (49)
IBD-U	8 (2)
PSC diagnosis, n (%)	20 (6)
Previous CRN, n (%)	48 (15)
Risk category[#], n (%)	
High	46 (15)
Intermediate	173 (56)
Low	91 (29)
Academic medical center, n (%)	210 (68)
Baseline questionnaire	
Burden of IBD symptoms, scale 1–10,[*] median (IQR)	3 (1.3–5.0)
Influence IBD on life, scale 1–10,[**] median (IQR)	3 (2–6)
Perceived burden of colonoscopies, scale 1–5,[***] median (IQR)	2 (1–3)
Perceived burden of bowel preparation, scale 1–5,[***] median (IQR)	4 (3–4)
Perceived CRC risk, percentage, median (IQR)	25 (10–50)
Perceived CRC risk higher than general population,[##] n (%)	127 (41)
Positive family history CRC (any degree),[###] n (%)	84 (27)
Knowing someone affected by CRC, n (%)	126 (41)
Experience during colonoscopy, n (%)	
No pain/discomfort	145 (47)
A little pain/discomfort	141 (45)
A lot of pain/discomfort	24 (8)
Level of education, n (%)	
University or college	141 (45)
Secondary school or vocational college	158 (51)
Primary school or less (including no schooling or unknown)	11 (4)

Abbreviations: CD, Crohn's disease; CRC, colorectal cancer; CRN, colorectal neoplasia; IBD, inflammatory bowel disease; IBD-U, IBD-unclassified; IQR, interquartile range; PSC, primary sclerosing cholangitis; UC, ulcerative colitis.
*Likert scale: no complaints to severe complaints
**Likert scale: no influence to severe influence
***Likert scale: no burden to severe burden
#Risk category was based on the Dutch surveillance guideline (shown in Supplementary Data 2)
##Perceived CRC risk higher than general population *versus* equal or smaller
###Family history for CRC is unknown for 15 patients.

some difficulties but was overall doable, whereas 7 respondents (2.3%) did not understand the concept. Twenty-eight respondents failed the dominance task (9.0%). Task nonattendance was observed in 1 respondent, and attribute dominance was present in 5 respondents (ie, no trade-offs

Multinomial Logit Analysis

Respondents' choices were significantly affected by the attributes and levels in the choice tasks. Bowel preparation was the attribute impacting patients' preferences most (attribute importance score, 40.5%), followed by surveillance interval and CRC risk reduction (attribute importance scores of 31.1% and 28.4%, respectively, Figure 1A). Respondents preferred the lowest volume of laxatives for bowel preparation and the highest reduction in CRC risk (Figure 2, total sample). Of note, the 2-year surveillance interval was preferred over all other intervals.

Latent Class Analysis

We identified the best-fitting model containing 3 classes in LCA (results and interpretations in Supplementary Data 6). The 3 identified groups were termed "CRC risk avoidant," "surveillance avoidant," and "surveillance preferring" (respectively 32.1%, 32.4%, and 35.2% of the overall sample, Figure 1B). The "surveillance preferring" group had the strongest preference for more frequent surveillance, especially compared with the "surveillance avoidant" group. The "CRC risk avoidant" group prioritized CRC risk reduction over the other 2 attributes. The group of "surveillance avoidant" patients had, in addition to the preference for the minimum volume of bowel preparation, a strong preference for less frequent surveillance, combined with a relatively high part-worth utility for the "none" option in the dual-response none task (Figure 2).

Both the "surveillance avoidant" and "CRC risk avoidant" groups were compared with the reference group "surveillance preferring" on clinical characteristics (Table 3). The "CRC

risk avoidant" group contained more patients with a higher level of education (univariable odds ratio [OR], 3.77; 95% confidence interval [CI], 2.13–6.67) and patients of younger age (per years; univariable OR, 0.95; 95% CI, 0.93–0.97). In the "surveillance avoidant" group, significantly fewer patients perceived their CRC risk higher than the general population (univariable OR, 0.49; 95% CI, 0.27–0.87). The "surveillance avoidant" group reported a significantly higher burden of bowel preparation compared with the reference group (univariable OR, 2.51; 95% CI, 1.42–4.46) and included patients with a younger age (univariable OR, 0.96; 95% CI, 0.94–0.98), as well. In multivariable analysis, these variables remained significantly different between the "surveillance avoidant" and "CRC risk avoidant" group compared with the "surveillance preferring" group. In addition, the "CRC risk avoidant" group reported a significantly lower burden of colonoscopies (multivariable OR, 0.42; 95% CI, 0.18–0.97). Of note, neither treatment in academic medical centers nor patients' risk category influenced group membership.

Trade-offs and Willingness to Participate

Patients were willing to trade a shortening of surveillance intervals from 3-yearly to annually for an absolute CRC risk reduction of 3.1%, based on a marginal part-worth utility of 1% CRC risk of 0.1694 (β-coefficient). Similarly, patients were willing to trade a decrease in bowel preparation volume from 2 L to 0.3 L for an absolute CRC risk increase of 1.4% (Table 4).

The expected willingness to participate for the total sample was 79.2% (95% CI, 76.8%–80.3%). A change in surveillance characteristics resulted in different participation rates (Supplementary Data 7). The "surveillance avoidant"
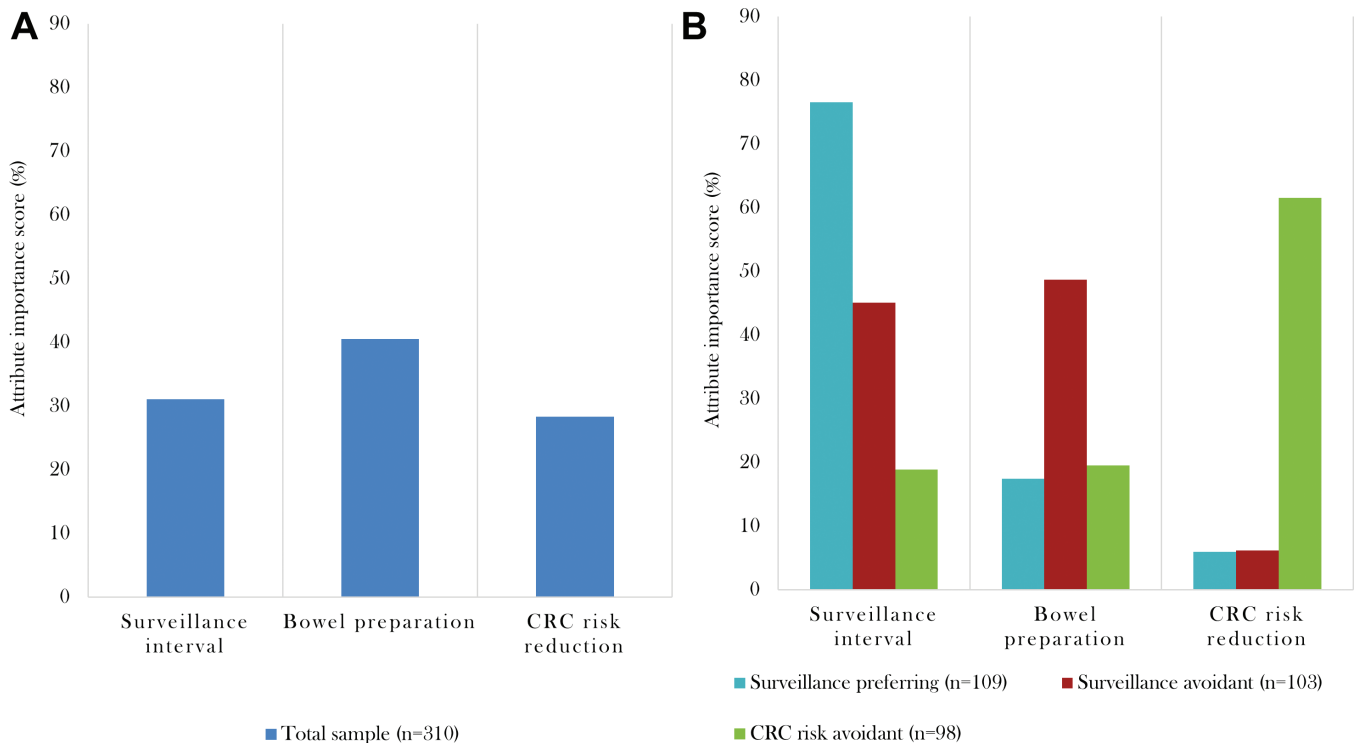

Figure 1. Attribute importance scores for total sample (A) and latent classes (B), percentages. Importance scores displayed for the total sample (A) and each subgroup (B; in %). A higher score indicates a higher importance of the attribute for patients relative to the other attributes.
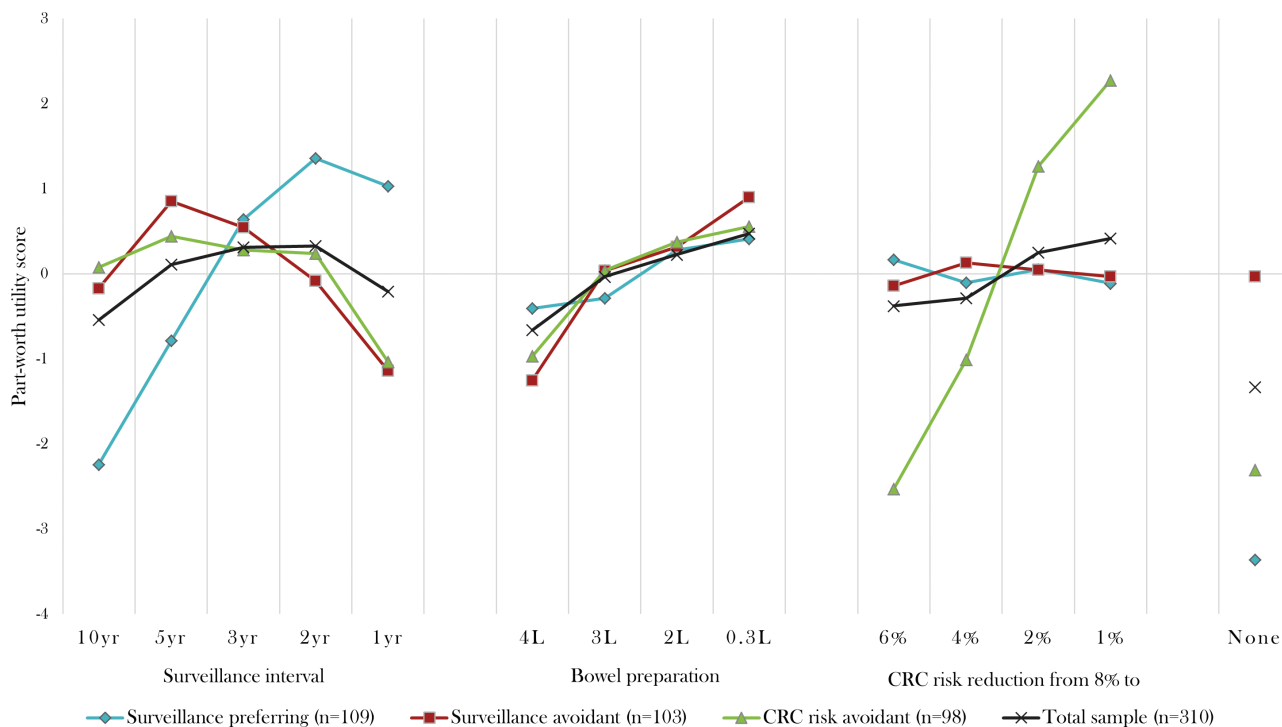
Figure 2. Part-worth utility scores (0-centered), total sample and latent classes. Part-worth utility scores indicate the relative preference of a level within the attribute, with lower scores indicating a less preferred level.

group showed the lowest willingness to participate (50.8%; 95% CI, 46.7%–52.9%) compared with the "surveillance preferring" and "CRC risk avoidant" groups (79.2%; 95% CI, 76.8%–80.3% and 90.9%; 95% CI, 85.9%–92.8%, respectively).

Discussion

In this study, we explored patient preferences regarding CRC surveillance in IBD. We identified volume of bowel preparation as the attribute with the greatest impact on patients' preferences and expected willingness to participate. Colorectal cancer risk reduction and surveillance interval affected patients' preferences comparably. Overall, a 2-year surveillance interval, with a maximal CRC risk reduction and a low-volume bowel preparation was found to be the preferred surveillance strategy. Furthermore, 3 distinct preference groups were identified.

This is the first study, to date, exploring patient preferences in the setting of colitis-associated CRC surveillance, employing a DCE approach. Recently, a structured questionnaire study reported high acceptance rates for frequent surveillance procedures in 298 IBD patients, with 49.5% of patients accepting yearly surveillance colonoscopies.[10] The most preferred surveillance intervals in our study were 2 or 3 years. A 10-year interval was the least preferred level. This finding corresponds with other DCEs investigating patient preferences concerning surveillance programs in non-IBD cohorts.[15,22] Of note, the possibility to assess endoscopic disease activity during surveillance procedures might impact preferred surveillance intervals in IBD patients; 33.5% of the included patients indicated evaluation of disease activity as the main reason to undergo surveillance at their most preferred interval.

In accordance with previous health care DCEs, patients preferred the highest CRC risk reduction.[23, 24] A linear trend was observed in CRC risk reduction and part-worth utility scores. The importance of CRC risk reduction was valued differently by participants, as expressed by the attribute important scores of the 3 subgroups. Especially the "surveillance avoidant" group, characterized by a lower perceived CRC risk compared with the "surveillance preferring" group, valued surveillance interval and volume of bowel preparation over CRC risk reduction. This is consistent with other studies in which illness perceptions and treatment beliefs are of importance in patients' evaluations of medical interventions such as screening colonoscopies in the general population.[25,26]

In line with a previous study, bowel preparation was identified as the most important attribute, with patients preferring lower-volume bowel preparation.[9] Bowel preparation quality has to be sufficient to enable adequate surveillance, which is especially important to enable detection of colitis-associated neoplasia.[8] Previous meta-analyses comparing different bowel preparation regimens on quality of bowel preparation show conflicting results.[27,28] Low-volume regimens are reportedly associated with better patient acceptance and willingness to repeat the same preparation.[27] Our study shows that the "surveillance avoidant" group has distinct characteristics such as younger age and a perceived high burden of bowel preparation. These findings underscore the importance of shared decision-making regarding the optimal individual bowel preparation, in addition to following hospital protocols, as expected willingness to participate rates were influenced by the volume of bowel preparation.

Our data suggest that the current strategy for CRC surveillance is valued differently between IBD patients. Despite these differences, most IBD patients are willing to undergo surveillance, even if this results in high-volume bowel preparation,

Table 3. Results univariable and multivariable multinomial logit model, reference group "surveillance preferring."

Characteristic	Ref. Group: Surveillance Preferring	Univariable OR (95% CI)	P value	Multivariable OR (95% CI)	P value
Female sex	Surveillance avoidant	1.61 (0.92–2.83)	0.098	1.55 (0.81–2.95)	0.18
	CRC risk avoidant	0.74 (0.43–1.27)	0.28	0.99 (0.52–1.87)	0.97
Age, per year increase	Surveillance avoidant	0.96 (0.94–0.98)	<0.05	0.97 (0.94–0.99)	<0.05
	CRC risk avoidant	0.95 (0.93–0.97)	<0.05	0.96 (0.93–0.98)	<0.05
Academic medical center	Surveillance avoidant	0.85 (0.48–1.53)	0.59		
	CRC risk avoidant	1.01 (0.56–1.80)	0.98		
High level of education*	Surveillance avoidant	1.65 (0.94–2.92)	0.08	1.38 (0.73–2.63)	0.32
	CRC risk avoidant	3.77 (2.13–6.67)	<0.05	3.24 (1.71–6.17)	<0.05
Perceived CRC risk higher than general population**	Surveillance avoidant	0.49 (0.27–0.87)	<0.05	0.40 (0.21–0.76)	<0.05
	CRC risk avoidant	1.16 (0.67–1.98)	0.60	1.10 (0.59–2.06)	0.76
Positive family history of CRC (any relative)***	Surveillance avoidant	0.76 (0.41–1.39)	0.37		
	CRC risk avoidant	0.71 (0.39–1.30)	0.26		
Previous CRN, yes	Surveillance avoidant	0.49 (0.23–1.05)	0.07	0.99 (0.38–2.57)	0.98
	CRC risk avoidant	0.47 (0.22–0.99)	<0.05	0.87 (0.33–2.26)	0.77
Experienced burden of colonoscopies >3 (scale 1–5)#	Surveillance avoidant	1.03 (0.54–1.97)	0.93	0.68 (0.32–1.43)	0.31
	CRC risk avoidant	0.53 (0.26–1.08)	0.08	0.42 (0.18–0.97)	<0.05
Experienced burden of bowel preparation >3 (scale 1–5)#	Surveillance avoidant	2.51 (1.42–4.46)	<0.05	2.54 (1.32–4.87)	<0.05
	CRC risk avoidant	0.76 (0.44–1.30)	0.32	0.62 (0.32–1.19)	0.15
Burden of IBD symptoms >5 (scale 1–10) ##	Surveillance avoidant	0.51 (0.25–1.07)	0.08	0.56 (0.25–1.26)	0.16
	CRC risk avoidant	0.53 (0.26–1.08)	0.08	0.74 (0.34–1.65)	0.47
Risk category**** moderate vs low high vs low	Surveillance avoidant	1.27 (0.69–2.34) 0.72 (0.30–1.71)	0.45 0.46	1.03 (0.53–2.02) 0.93 (0.32–2.68)	0.93 0.90
	CRC risk avoidant	1.74 (0.93–3.25) 1.01 (0.43–2.36)	0.08 0.99	1.36 (0.68–2.72) 0.91 (0.31–2.66)	0.39 0.86

CI, confidence interval; CRC, colorectal cancer; CRN, colorectal neoplasia; OR, odds ratio.
*University or college versus secondary school or vocational college or primary school or less or unknown.
**Perceived CRC risk higher than general population *versus* equal or smaller
***If unknown (n = 15) they were included in negative family history of CRC
****Risk category was based on the Dutch surveillance guideline (shown in Supplementary Data 2)
#Likert scale: no burden to severe burden
##Likert scale: no complaints to severe complaints

less appealing surveillance intervals, or a limited CRC risk reduction. Moreover, the findings of this study can be generalized to settings outside the Netherlands. Bowel preparation regimens correspond with schemes widely available, and the examined intervals overlap with the surveillance intervals recommended in leading guidelines. Interestingly in the "surveillance avoidant" group, the part-worth utility score in the dual-response question for no surveillance was higher than that of the other 2 groups, corresponding with a lower expected willingness to participate. Similar to our results, previous studies showed that factors including a high level of education, younger age, and previous experience with screening were associated with a higher screening participation rate.[29–31] As stated previously, the concept of shared decision-making is an important aspect of the management of IBD.[5] This is exemplified by studies on patients' preferences for remission induction therapy in IBD.[13,32] Our findings might aid in the process of shared decision-making for CRC surveillance in IBD, taking into account the most important aspects of surveillance from the patient's perspective.

This study has multiple strengths. We have adapted best-practice methods as stated in the ISPOR guidelines,[11,21] including extensive patient engagement in developing the questionnaire. We included a large number of patients from academic centers and 1 large regional teaching hospital to produce generalizable outcomes. To increase the general understanding of participants, the questionnaire started with information on surveillance and the CRC risk in IBD and a practice task. We limited the number of questions, attributes, and levels to reduce the complexity and burden for patients to minimize bias. Of note, our study showed a response rate of more than 80%, with excellent validity test results. The LCA allowed adjustment for heterogeneity in preferences, which has previously been shown to explain important differences in patient evaluations of medical interventions in IBD.[13]

We acknowledge some limitations of our study. First, we did not include validated questionnaires on patient illness perceptions, risk perception, treatment beliefs, or worries to reduce the length of the questionnaire. Also, no question on a personal history of (nongastrointestinal) cancer was included, whereas this might impact patient's opinion on surveillance. We intentionally reduced the total number of questions to prevent low response rates, high numbers of incomplete questionnaires, and task nonattendance.[33] The included questions, however, were extensively discussed with experts and within focus groups. Second, preferences derived from this study are based on hypothetical choice scenarios. Obviously, real-life choices are the result of a multitude of conscious and unconscious preferences, which could not all be addressed in a questionnaire. For instance, out-

Table 4. Trade-offs for change in CRC risk in relation to surveillance interval (A) and bowel preparation (B).

A

Level	CRC risk reduction between levels (%)
1 yrs	Reference
2 yrs	3,1
3 yrs	3,0
5 yrs	1,8
10 yrs	-1,9

B

Level	CRC risk reduction between levels (%)
0,3 L	Reference
2 L	-1,4
3 L	-2,9
4 L	-6.5

Part-worth utility values cannot be compared directly; therefore, (difference) ratios are used to display differences in value. The CRC risk differences are compared with the reference level. Positive values indicate that participants are willing to accept an increased CRC risk compared with the reference level

of-pocket costs were not included as an attribute in the DCE, since the Netherlands has a universal health care system and focus groups pointed out that inclusion of willingness-to-pay would have resulted in errors in interpretation. In addition, the attribute of CRC risk reduction is positively framed and could result in patients preferring the lowest CRC risks, as opposed to negatively framed questions.[34] However, the included attributes and levels are the result of an elaborate selection process. Last, patient selection from the endoscopy department may have impacted patients' risk profiles, inasmuch as high-risk patients attend the department more often.

Conclusions

In conclusion, this study using a DCE identified volume of bowel preparation as the attribute which impacts patients' preferences on CRC surveillance in IBD most, closely followed by CRC risk reduction and surveillance interval. We identified 3 patient groups with differential clinical characteristics and specific preferences. In the future, these findings may help to develop an endoscopic surveillance strategy that is tailored to the individual IBD patient.

Supplementary Data

Supplementary data is available at *Inflammatory Bowel Diseases* online.

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Conflicts of Interest

The authors state no conflict of interest.

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