

Assessing overall patient satisfaction in inflammatory bowel disease using structural equation modeling

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Background/aims Structural equation modeling (SEM) is a very popular data-analytic technique for the evaluation of customer satisfaction. We aimed to measure the overall satisfaction of inflammatory bowel disease (IBD) patients with healthcare in Portugal and to define its main determinants using SEM.

Patients and methods The study included three steps: (i) specification of a patient satisfaction model that included the following dimensions: Image, Expectations, Facilities, Admission process, Assistant staff, Nursing staff, Medical staff, Treatment, Inpatient care, Outpatient care, Overall quality, Overall satisfaction, and Loyalty; (ii) sample survey from 2000 patients, members of the Portuguese Association of the IBD; and (iii) estimation of the satisfaction model using partial least squares (XLSTAT-PLSPM).

Results We received 498 (25%) valid questionnaires from 324 (66%) patients with Crohn's disease and 162 (33%) patients with ulcerative colitis. Our model provided a substantial explanation for Overall satisfaction ($R^2 = 0.82$). The mean index of overall satisfaction was 74.4 (0–100 scale). The main determinants of Overall satisfaction were the Image ($\beta = 0.26$), Outpatient care ($\beta = 0.23$), and Overall quality ($\beta = 0.21$), whose mean indices were 83, 75, and 81, respectively. Facilities and Inpatient care were the variables with a significant impact on Overall satisfaction and the worst mean indices.

Conclusion SEM is useful for the evaluation of IBD patient satisfaction. The Overall satisfaction of IBD patients with healthcare in Portugal is good, but to increase it, IBD services need to focus on the improvement of Outpatient care, Facilities, and Inpatient care. Our model could be a matrix for a global model of IBD patient satisfaction. *Eur J Gastroenterol Hepatol* 27:941–950
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Introduction

Patient satisfaction is increasingly becoming the focus of research and evaluation of medical treatments, services, and interventions [1]. This increasing interest in patient satisfaction parallels the rise of 'the patient as an active consumer of healthcare services rather than merely as a passive recipient' [2]. Measurement of patient satisfaction is important for a number of reasons: it can be used as an indicator of quality of healthcare; it can help to identify potential areas for service improvement and health expenditure that may be optimized through patient-guided planning and evaluation; it can indicate variations in the quality of care across regions or even within the same hospital or care center; and also, it can help to monitor the

evolution in standards of care over time [3]. Moreover, the achievement of patient satisfaction is a worthy clinical end point in itself: it has been reported that satisfaction may predict whether patients comply with treatment [4], play an active role in their own care [5], continue using medical care services, and remain within a health provider or a specific system [6,7].

Although the measurement of patient satisfaction has been studied for years, there is no consensus on its definition and the best methodology to measure it [8–10]. Recently, some studies have been applying marketing research strategies to assess patient satisfaction [11–17]. Like the pursuit of customer loyalty to products and services in the market, patient satisfaction is studied to evaluate the intentions of patient behavior to monitor and predict the return to service or to look for other providers. These studies have used structural equation modeling (SEM), a very popular data-analytic technique, for the evaluation of customer satisfaction as it enables the estimation of causal relationships [11–13,18–20].

Crohn's disease (CD) and ulcerative colitis (UC) are chronic inflammatory bowel diseases (IBDs) with an increasing incidence and prevalence [14]. In Portugal, the prevalence of IBD increased from 86 patients per 100 000 in 2003 to 146 in 2007 [15]. The prevalence increased from 42 and 43 per 100 000 in 2003 to 71 and 73 in 2007, respectively, for UC and CD [15]. The early onset, the chronic nature of the illness, and the absence of cure mean that long-term management is required [16]. These patients require frequent contacts with the healthcare

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system for lifelong medication, social and psychological support, and follow-up in outpatient clinics [17]. Nevertheless, IBD has a considerable impact on the quality of life of patients and families [21,22]. Disease management is multifaceted and requires the appropriate physical infrastructure and facilities, access to appropriate diagnostic procedures and treatments, on-going education for clinicians and other healthcare staff, the development of adequate communication skills among healthcare staff, and provision of information and support mechanisms for patients and families, among others [14]. Being a lifelong condition with a significant burden of illness, IBD is particularly suitable to assess quality of healthcare measurement and improvement [16]. Although many studies on IBD patient-reported outcomes have been published, in recent years, only one has evaluated overall patient satisfaction as the main objective [3,23]. Moreover, no data exist on the quality of healthcare for IBD patients in Portugal. The organization of healthcare for IBD patients in Portugal is also largely unknown. In Portugal, the healthcare for IBD patients is provided mainly by public hospitals. Nonetheless, according to data from the Portuguese central administration of the health system, only one-third of public hospitals have IBD-dedicated outpatient clinics [24]. Recognizing that there may be variations in the quality of care across regions and hospitals, the Portuguese Study Group of IBD (GEDII) is currently developing a project to define a quality-of-care model for IBD patients. The satisfaction of Portuguese IBD patients may thus be used as an indicator of the quality of healthcare for IBD patients in Portugal.

Thus, our main goals were to measure the overall satisfaction of IBD patients with healthcare in Portugal and to define its main determinants using SEM.

Patients and methods

Specification of patient satisfaction model

As stated above, we used SEM for the evaluation of patient satisfaction. This methodology has three main steps: (i) specification of a patient satisfaction model; (ii) sample survey; and (iii) estimation of the patient satisfaction model using the data from the survey.

The structural equation model is composed of two models [13,25]: (i) the structural model that integrates theoretical relationships among nonobserved variables, also called latent variables (LVs); and (ii) the measurement model that integrates theoretical relationships among LVs with observed variables, also called manifest variables (MVs).

Our model of patient satisfaction was based on the model of the European Customer Satisfaction Index (ECSI) [26–28]. The ECSI model has largely been used to measure customer satisfaction in several companies, industries, and countries. In Portugal, it has also been adapted for the evaluation of satisfaction of general patients with the healthcare that is provided by public hospitals in the inpatient, outpatient, and emergency settings [29,30]. In our model, some adaptations were made to incorporate the ECCO consensus on optimization of quality of healthcare in IBD [14]. The patient satisfaction model adopted is shown in Fig. 1. In this model, the Overall satisfaction variable emerges as the central variable and is encased within a system of cause and effect running from

its determinants (Image, Expectations, Facilities, Admission process, Assistant staff, Nursing staff, Medical staff, Treatment, Inpatient care, Outpatient care, Overall quality) to its consequent (Loyalty). As the LVs of the structural model were not subjected to direct observation, they were associated with a set of MVs that were directly obtained from survey of patients. On the basis of the ECSI model, we used a reflective measurement model, in which causal action flows from LV to MV [26,28]. Table 1 presents the MV associated with each LV.

Sample survey

The target population of this study included all IBD patients who were treated in public hospitals in Portugal mainland and islands. The patients included were 18 years of age or older and members of the Association of Portuguese Patients with IBD (APDI). Patients were excluded if they had an invalid address, answered less than 80% of the questions or did not answer any of the key questions (questions on Overall satisfaction and Overall quality), or were followed in private clinics.

The questionnaire was designed in partnership with the GEDII and APDI, whose members also actively participated in the divulgation of the study and in the distribution and reception of the questionnaires. The questionnaire included 44 questions that were related to the 13 LVs of the measurement model. Each question was an MV and was answered using a Likert scale of 1–10, where 10 represented the higher degree of satisfaction or quality and 1 represented the lowest degree of satisfaction or quality. Twenty-nine questions on sociodemographic and clinical attributes of patients were also included. Thus, the final questionnaire consisted of 73 questions.

The questionnaires, along with an informed consent for participation in the study and a prepaid envelope for sending the replies, were sent by mail to all the members (2000) of APDI between October 2012 and November 2012. The sample size was calculated on the basis of the popular rule of thumb for robust variance-based partial least squares SEM (PLS-SEM) estimations that was suggested by Barclay *et al.* [31]: minimum sample size of 10 times the maximum number of paths aiming at any LV in the measurement model (i.e. the number of MV per LV) and the structural model (i.e. the number of LVs directed at a particular LV). In our model, the LV with higher number of paths was Inpatient care, which had 11 MVs. According to the rule of Barclay *et al.* [31], we needed a minimum of 110 participants. If we assumed a patient participation rate of 25% (a rate obtained in similar studies carried out by GEDII) [32], we would have to invite 440 participants. Taking into account the possibility of invalid or incomplete questionnaires, we decided to invite all the members (2000) of APDI.

Estimation of the patient satisfaction model

The estimation of our patient satisfaction model was performed by PLS-SEM. A structural equation model is usually analyzed and interpreted sequentially in two stages: (i) the assessment of the reliability and validity of the measurement model, followed by (ii) the assessment of the structural model using the PLS bootstrap procedure [13,25,33]. This sequence ensures that the researcher has

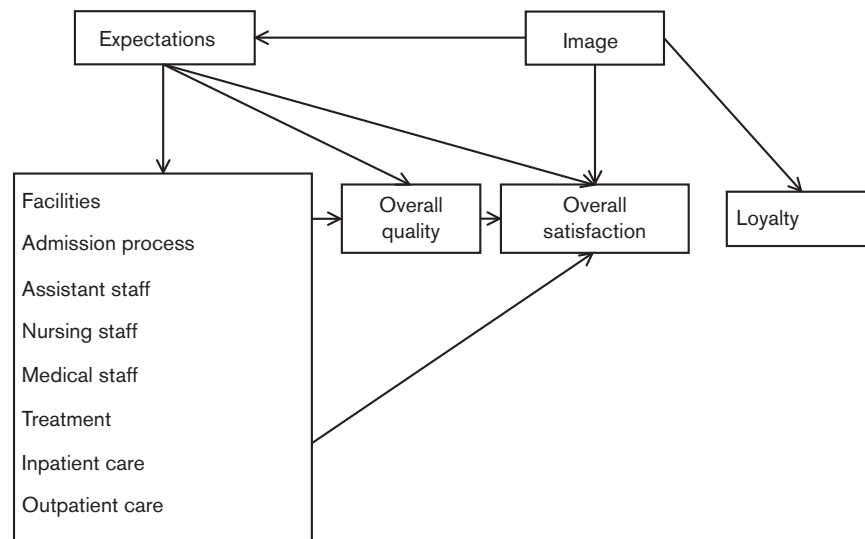


Fig. 1. Structural model of patient satisfaction. In this model, the Overall satisfaction variable emerges as the central variable and is encased within a system of cause and effect running from its determinants (Image, Expectations, Facilities, Admission process, Assistant staff, Nursing staff, Medical staff, Treatment, Inpatient care, Outpatient care, Overall quality) to its consequent (Loyalty).

reliable and valid measures of LV before attempting to draw conclusions on the nature of the relationships among LVs.

Measurement model

The measurement model specifies the relationships among the MVs and the underlying LVs. Generally, reflective LVs are assessed on the basis of the two concepts of reliability and validity [13,25,33]. Reliability was assessed both at the LV (through composite reliability CR, which is considered acceptable above a value of 0.7 for established LV and above 0.6 in the early stages of research) and at the MV level (through the absolute standardized outer loadings, which should be higher than 0.7).

Validity was evaluated through convergent and discriminant validity. Convergent validity was assessed through the average variance extracted (AVE), which should exceed 0.5. For discriminant validity, two criteria were used. First, the Fornell–Larcker criterion compares the AVE of an LV with the squared correlations between the LV and any other LV of the model. Discriminant validity can be stated if the AVE of the LV is larger than any other squared correlation. Second, the cross-loadings were compared to determine whether the loadings of MV with the corresponding LV were higher than with other LV.

Structural model

The structural model describes the relationships among LVs. Several nonparametrical tests can be used to evaluate the quality of the structural model: (i) the determination coefficient R^2 ; (ii) path coefficients; and (iii) goodness-of-fit (GoF) index [33]. The determination coefficient R^2 (analogous to multiple regression) reflects the level or share of the explained variance of each endogenous LV. Path coefficients reflect the β coefficients for which sign, magnitude, and significance (by bootstrapping) levels are analyzed. The GoF index takes into account the performance of both the measurement and the structural models,

and thus provides a single measure for the overall prediction performance of the model. It can assume values between 0 and 1, where a higher value represents better path model estimations. The GoF criteria for small, medium, and large effect sizes would be 0.1, 0.25, and 0.36, respectively.

Statistical analysis

As stated above, estimation of the patient satisfaction model was performed by PLS-SEM using the software XLSTAT-PM Addinsoft (version 2012; XLSTAT; Addinsoft, New York, NY, USA). To avoid or reduce bias related to inexistent or missing data, these were substituted using the non-linear iterative PLS algorithm that is incorporated into XLSTAT-PM [12]. The remaining statistical analysis was carried out using the program IBM SPSS (SPSS, version 20.0; SPSS Inc., Chicago, Illinois, USA). The normality of distribution of data was assessed using the Shapiro–Wilk test and by evaluation of skewness and kurtosis. A descriptive analysis was carried out for all variables using the absolute and relative frequencies for categorical variables and the mean (SD) or the median (P75–P25) for continuous variables. Moreover, we also carried out an analysis of Overall satisfaction according to the sociodemographic and clinical characteristics of patients using linear regression (for continuous variables) and ANOVA, followed by a post-hoc Tukey’s test (for categorical variables). Variables with a significant association with Overall satisfaction in univariate analysis were used for multivariate analysis (multiple regression). The P value was set at 0.05.

Ethical considerations

The study was carried out in accordance with the Declaration of Helsinki and its amendments and Good Clinical Practice guidelines. All data were collected anonymously and there was no way of relating the questionnaires with the patients.

Table 1. Description of manifest and latent variables

Latent variables	CR	AVE	Manifest variable	Mean (SD)	Standardized loadings	Standardized weight	Priority index
Image	0.94	0.85	Trustworthiness of the service	8.56 (1.65)	0.94	0.32	30.73
			Experience of the service	8.65 (1.60)	0.89	0.29	26.11
			Carefulness of the service	8.34 (1.93)	0.93	0.39	43.17
Expectations	1.00	1.00	Expectations of the overall quality	7.09 (2.03)	1.00	1.00	100
Facilities	0.97	0.88	Cleaning and hygiene	7.45 (2.13)	0.90	0.24	23.21
			Comfort and convenience	7.45 (2.13)	0.95	0.25	24.17
			Protection of privacy	7.23 (2.22)	0.93	0.26	27.31
			Overall quality	7.33 (2.08)	0.96	0.25	25.31
Admission process	1.00	1.00	Overall quality	7.54 (2.02)	1.00	1.00	100
Assistant staff	1.00	1.00	Professional competence	7.82 (1.84)	1.00	1.00	100
Nursing staff	0.99	0.95	Friendliness and availability	8.44 (1.62)	0.96	0.25	24.57
			Speed of response	8.28 (1.76)	0.97	0.26	28.18
			Competence and professionalism	8.50 (1.59)	0.98	0.24	22.68
			Overall performance quality	8.44 (1.62)	0.98	0.25	24.57
Medical staff	0.97	0.85	Care and accessibility	8.61 (1.79)	0.93	0.21	22.03
			Competence and professionalism	8.99 (1.42)	0.87	0.17	12.96
			Explanation about the disease	8.55 (1.75)	0.94	0.20	21.88
			Explanation about treatments and examinations	8.52 (1.81)	0.94	0.22	24.57
			Overall performance quality	8.77 (1.56)	0.93	0.20	18.56
Treatment	1.00	1.00	Satisfaction with medication	7.91 (2.14)	1.00	1.00	100
			Satisfaction with surgery ^a	–	–	–	–
Inpatient care	0.96	0.66	Waiting time for treatments and examinations	6.90 (2.27)	0.78	0.09	10.23
			Privacy for treatments and examinations	7.42 (2.09)	0.82	0.09	8.52
			Overall quality of treatments and examinations	7.64 (1.86)	0.85	0.09	7.79
			Schedule of visits	7.82 (1.84)	0.78	0.07	5.60
			Ease of accompaniment by relatives	7.87 (1.97)	0.79	0.08	6.25
			Quality of meals	6.30 (2.39)	0.80	0.10	13.57
			Support during the meals	6.79 (2.37)	0.82	0.10	11.78
			Overall quality of meals and related services	6.55 (2.28)	0.84	0.09	11.39
			Information provided at discharge	7.85 (1.98)	0.83	0.10	7.89
			Delay between discharge decision and effective discharge	7.53 (2.17)	0.78	0.10	9.06
			Overall satisfaction with inpatient care	7.84 (1.85)	0.85	0.10	7.92
Outpatient care	0.93	0.77	Satisfaction with the number of visits per year	7.94 (2.25)	0.85	0.25	22.44
			Satisfaction with the average waiting time	6.96 (2.53)	0.85	0.26	34.43
			Satisfaction with access to the gastroenterologist	7.98 (2.24)	0.89	0.25	22.00
			Overall quality of outpatient care	8.06 (1.98)	0.92	0.25	21.13
			Satisfaction with outpatient clinic of Nutrition ^a	–	–	–	–
			Satisfaction with outpatient clinic of Psychology/ Psychiatry ^a	–	–	–	–
Overall quality	1.00	1.00	Overall quality of the service	8.26 (1.74)	1.00	1.00	100
Overall satisfaction	0.93	0.81	Overall satisfaction	8.16 (1.89)	0.88	0.31	24.69
			Fulfillment of expectations	7.62 (1.99)	0.90	0.33	34.00
			Approximation to the ideal hospital	7.35 (2.16)	0.92	0.36	41.30
Loyalty	0.94	0.89	Probability of choosing the same service	8.25 (2.30)	0.95	0.50	53.03
			Probability of recommending the service	8.45 (2.07)	0.94	0.50	46.97

AVE, average variance extracted (it should be > 0.5); CR, composite reliability (it should be > 0.6).

^aRemoved from the final model of patient satisfaction because they did not fulfill the criteria of reliability.

Results

Characterization of the sample

From the 2000 questionnaires that were sent, we obtained 562 (28%) responses. From these, we excluded 10 (1.8%) questionnaires because they were from individuals younger than 18 years of age, 17 (3%) because they involved patients treated in private clinics, and 37 (6.6%) because over 80% of the data were incorrect or absent or any of the key questions were not answered. Thus, we analyzed 498 (25%) questionnaires.

The sociodemographic and clinical characteristics of patients by the type of disease are shown in Table 2. Most patients were women (57%) and the median age was 42 years. Most patients had the secondary educational level (45%), were employed (66%), resided in the north of the country (41%), and were treated in hospitals with a higher level of differentiation in gastroenterology (73%), that is, hospitals that serve a population greater than 300 000 habitants, have a polyvalent emergency service,

and laboratories of molecular biology, immunology, and pathological anatomy. Most patients never smoked (53%).

Three hundred and twenty-four (66%) patients had CD, 162 (33%) with UC and nine (2%) with unclassified IBD/undetermined colitis. The median duration of disease was 13 years. Eighty-six percent of the patients were taking an oral 5-aminosalicylic acid (5-ASA), 42% were taking a systemic corticosteroid, 50% were taking an immunosuppressor, and 34% were taking a biological. Most patients were in clinical remission (64%). Most patients had at least one relapse during the previous year (63%). The last relapse occurred more than 3 months ago in most patients (52%). Sixty-one percent of the patients had already developed extraintestinal manifestations. Fifty-six percent of the patients had not undergone any surgery because of their IBD. Most patients (79%) had been hospitalized at least once because of their IBD. The main source of information on IBD was the gastroenterologist (79%). The most used means of urgent

Table 2. Sociodemographic and clinical characteristics of the sample ($n = 498$) used for estimation of the patient satisfaction model

Parameters	Value [n (%)]
Age [median (P25–P75)] (years)	42 (33–50)
Sex	
Male	214 (43.1)
Female	282 (56.9)
Highest level of education	
No formal education/primary	74 (14.9)
Secondary	224 (45.0)
University/postgraduation	199 (40.1)
Employment situation	
Employed	327 (65.8)
Unemployed	66 (13.3)
Student	25 (5.0)
Pensioner	65 (13.1)
Housekeeper	14 (2.8)
Place of residence	
North	203 (40.8)
Center	99 (19.9)
Lisbon and Tagus valley	148 (29.8)
Alentejo and Algarve/Madeira and Azores	47 (9.5)
Level of hospital differentiation ^a	
Higher differentiation	350 (72.6)
Lower differentiation	132 (27.4)
Number of relapses during the previous year	
0	185 (37.1)
1–2	190 (38.2)
≥ 3	123 (24.7)
Time since last relapse (months)	
0–3	240 (48.2)
4–12	195 (39.2)
> 12	63 (12.7)
Number of hospitalizations	
0	107 (21.5)
1–2	189 (37.9)
≥ 3	202 (40.6)
Medication	
Oral 5-ASA	426 (85.5)
Topic 5-ASA	178 (35.7)
Systemic corticosteroid	207 (41.6)
Topic corticosteroid	110 (22.1)
Immunosuppressor	249 (50.0)
Biological	170 (34.1)
Number of surgeries	
0	279 (56.1)
1–2	157 (31.6)
≥ 3	61 (12.2)
Main source of information about IBD	
Gastroenterologist	392 (79.0)
Internet	37 (7.5)
APDI	50 (10.1)
Other	17 (3.4)
Smoking	
Never smoked	254 (52.5)
Current smoker	76 (15.7)
Ex-smoker	154 (31.8)
Type of disease	
Crohn's disease	324 (65.5)
Ulcerative colitis	162 (32.7)
UIBD/UnC	9 (1.8)
Evolution since diagnosis [median (P25–P75)] (years)	13 (7–19)
Disease activity	
In remission	318 (64.2)
Active	177 (35.8)
Disease location	
Stomach	21 (4.3)
Small bowel	247 (50.8)
Large bowel	311 (64.0)
Rectum	146 (30.0)
Extraintestinal manifestations	297 (60.7)
Type of extraintestinal manifestations	
Cutaneous	78 (16.0)
Ocular	71 (14.5)
Axial	72 (14.7)
Articular (large joints)	165 (33.7)
Articular (small joints)	155 (31.7)
Means of urgent contact with the specialist	
Personal contact	186 (38.9)

Table 2. (Continued)

Parameters	Value [n (%)]
Telephone/e-mail of hospital or service	196 (41.0)
Telephone of gastroenterologist	96 (20.1)
Number of outpatient visits per year	
0	4 (0.8)
1–2	190 (38.2)
≥ 3	304 (61.0)
Average waiting time in the outpatient clinic (min)	
0–30	179 (36.4)
30–60	222 (45.1)
> 60	91 (18.5)
Psychology outpatient clinic	
Yes	98 (19.8)
No	398 (80.2)
Nutrition outpatient clinic	
Yes	200 (40.3)
No	296 (59.7)
Complaints	
Yes	31 (6.2)
No	467 (93.8)

Missing values were not taken into account for calculation of %.

5-ASA, 5-aminosalicylic acid; APDI, Association of Portuguese Patients with IBD; IBD, inflammatory bowel disease; UIBD, unclassified inflammatory bowel disease; UnC, undetermined colitis.

^aLevel of differentiation defined according to the Portuguese Network for Hospital Referral in gastroenterology (hospitals with a higher level of differentiation serve a population $> 300\,000$ habitants, have a polyvalent emergency service, and laboratories of molecular biology, immunology, and pathological anatomy).

contact with the specialist were the telephone of the hospital/service (41%) and personal contact (39%). The median of outpatient visits per year was three. Most patients waited more than 30 min in the waiting room of the outpatient clinic (64%). Only 40 and 20% of patients had outpatient visits in Nutrition and Psychology/Psychiatry, respectively. Six percent of patients made an oral or a verbal complaint about the IBD unit.

Patient satisfaction model

Measurement model

From the initial model that was presented in the Patients and methods section, three MVs (satisfaction with surgical treatment, satisfaction with the outpatient clinic of Nutrition, and satisfaction with the outpatient clinic of Psychology/Psychiatry) did not fulfill the criteria of reliability. This was likely related to the low number of patients who were subjected to surgical treatment or had visited the outpatient clinic of Nutrition or Psychology/Psychiatry. These three MVs were excluded from the final patient satisfaction model that was used for the PLS-SEM analysis. The final model fulfilled all criteria of reliability and validity that were discussed in the Patients and methods section. The results of reliability (composite reliability and standardized loadings) and validity (AVE) are presented in Table 1.

The mean (SD) of MVs and the weight of each MV in the related LVs are shown in Table 1. The mean (SD) index of LVs and the frequency of each extract of values of LV are shown in Table 3. The LV with the highest and the lowest mean index were the Medical staff (83.5) and the Inpatient care (60.4), respectively. All LV had a predominantly good or very good evaluation. The mean index (SD) of Overall satisfaction was 74 (20), with most patients (78%) rating the Overall satisfaction as good or

Table 3. Mean indices and frequency of each category of latent variables

Latent variables	n (%)				Mean (SD)
	Poor (0–40)	Neutral (41–60)	Good (61–80)	Very good (81–100)	
Expectations	43 (8.6)	135 (27.1)	193 (38.8)	127 (25.5)	67.8 (22.3)
Facilities	55 (11.0)	90 (18.1)	187 (37.6)	166 (33.3)	69.1 (21.8)
Admission process	39 (7.8)	98 (19.7)	179 (35.9)	182 (36.5)	72.7 (22.4)
Assistant staff	21 (4.2)	84 (16.9)	199 (40.0)	194 (39.0)	75.6 (20.3)
Nursing staff	23 (4.6)	53 (10.6)	178 (35.7)	244 (49.0)	76.3 (17.8)
Medical staff	17 (3.4)	30 (6.0)	128 (25.7)	323 (64.9)	83.5 (17.3)
Treatment	30 (6.0)	80 (16.1)	149 (29.9)	239 (48.0)	76.8 (23.6)
Inpatient care	67 (13.5)	167 (33.5)	197 (39.6)	67 (13.5)	60.4 (18.0)
Outpatient care	34 (6.8)	84 (16.9)	158 (31.7)	222 (44.6)	74.9 (21.7)
Image	15 (3.0)	42 (8.4)	135 (27.1)	306 (61.4)	82.6 (17.8)
Overall quality	21 (4.2)	49 (9.8)	159 (31.9)	269 (54.0)	80.7 (19.4)
Overall satisfaction	32 (6.4)	75 (15.1)	158 (31.7)	233 (46.8)	74.4 (20.2)
Loyalty	34 (6.8)	42 (8.4)	98 (19.7)	324 (65.1)	81.7 (22.9)

very good. The MV with the highest weight (36%) in Overall satisfaction was ‘approximation to the ideal hospital’, whose mean (SD) value was 7.35 (2.16).

Structural model

Figure 2 shows the path coefficients (β) between different LV and the Overall satisfaction. LV with a statistically significant path coefficient on Overall satisfaction were, in descending order of path coefficient, Image, Outpatient care, Overall quality, Medical staff, Inpatient care, Facilities, and Treatment. Our patient satisfaction model provided a substantial explanation for Overall satisfaction, explaining 82% of its variance ($R^2=0.82$). The model showed a large overall prediction performance (GoF index = 0.426).

Recommendations and priority indexes

With the data obtained, it is possible to represent the relative performance of IBD services for each of the explanatory LV of Overall satisfaction, as well as its

importance in explaining this dimension. This is important to identify the areas that should receive greater attention to improve the Overall satisfaction. Figure 3 shows a map and is divided into four quadrants. Quadrant I includes the LV with higher mean indices and higher impact in Overall satisfaction (primary strengths of IBD services): Image and Overall quality. Quadrant IV includes the LV with lower mean indices and a higher impact on Overall satisfaction (primary priorities of IBD services): Outpatient care. Quadrant II includes the LV with higher mean indices and lower impact in Overall satisfaction (secondary strengths of IBD services): Medical staff and Treatment. Quadrant III includes the LV with LV with lower mean indices and lower impact in Overall satisfaction (secondary priorities of IBD services): Facilities and Inpatient care.

After determination of the priorities of IBD services, to improve IBD patient satisfaction, we evaluated the priority index of the MV associated with each LV (Table 1). This was calculated by combining the mean value and the weight of each MV in the LV. Thus, for Outpatient care (primary priority), the MV with the highest priority index

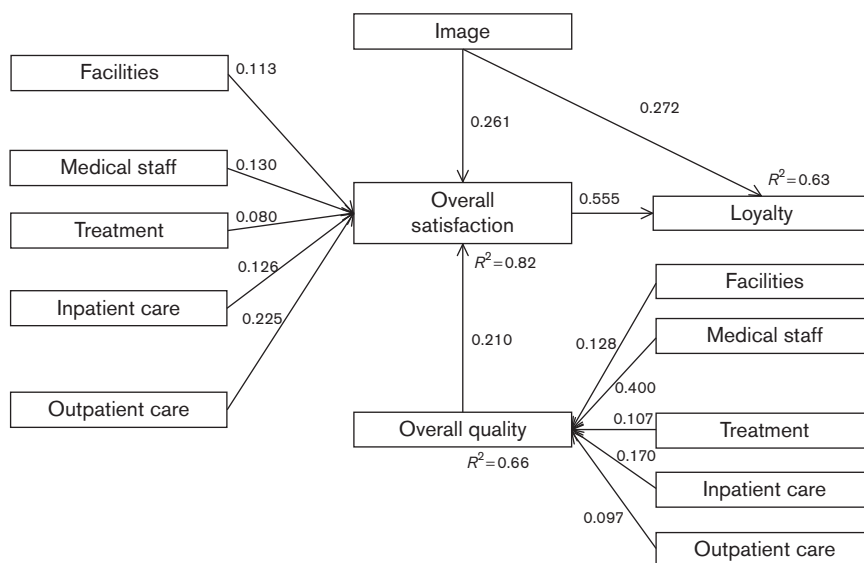


Fig. 2. Path coefficients and R^2 for Overall satisfaction, Overall quality, and Loyalty. Only statistically significant path coefficients are shown. Latent variable (LV) with a statistically significant path coefficient on Overall satisfaction were, in descending order of path coefficient, Image, Outpatient care, Overall quality, Medical staff, Inpatient care, Facilities, and Treatment. Our patient satisfaction model provided a substantial explanation for Overall satisfaction, explaining 82% of its variance ($R^2=0.82$).

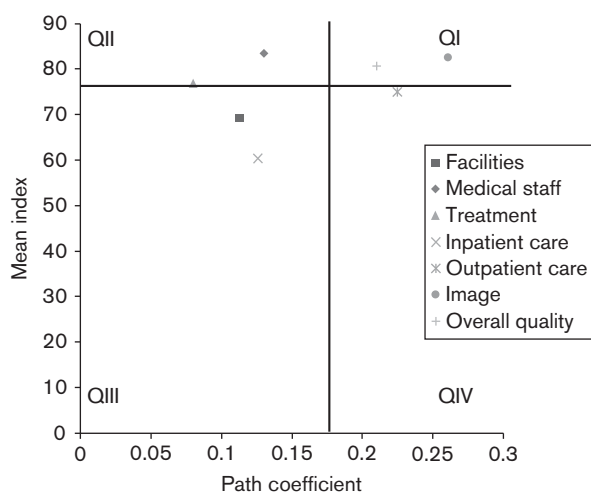


Fig. 3. Matrix combining the mean index of latent variables (LVs) and their impact (path coefficient) on Overall satisfaction. Quadrant I includes the LV with higher mean indices and higher impact on Overall satisfaction [primary strengths of inflammatory bowel disease (IBD) services]: Image and Overall quality. Quadrant IV includes the LV with lower mean indices and higher impact on Overall satisfaction (primary priorities of IBD services): Outpatient care. Quadrant II includes the LV with higher mean indices and lower impact on Overall satisfaction (secondary strengths of IBD services): Medical staff and Treatment. Quadrant III includes the LV with lower mean indices and lower impact on Overall satisfaction (secondary priorities of IBD services): Facilities and Inpatient care.

was 'satisfaction with the average waiting time for consultation' (34%). For Facilities and Inpatient care (secondary priorities), the MV with the highest priority index were 'protection of privacy' (27%) and 'quality of meals' (14%), respectively.

Association between sociodemographic and clinical characteristics and Overall satisfaction

Data on the univariate and multivariate analyses of the association between sociodemographic and clinical characteristics and Overall satisfaction are presented in Table 4. Overall satisfaction increased with the age of the patient. Patients with a primary level of education had higher Overall satisfaction than postgraduate patients (78.7 vs. 68.4). Unemployed patients had higher Overall satisfaction than employed patients (80.2 vs. 72.2). Patients with inactive disease had higher Overall satisfaction than patients with active disease (76.0 vs. 71.4). Patients with involvement of the stomach or the small joints had lower Overall satisfaction than patients who did not (64.4 vs. 75.2 and 70.7 vs. 75.9, respectively). Patients with one to two relapses during the previous year had lower Overall satisfaction than patients with no relapse (70.8 vs. 78.4). Patients with recent relapse had lower Overall satisfaction than patients with no recent relapse (71.1 vs. 79.6). Patients who were taking systemic corticosteroids had lower Overall satisfaction than patients who were not taking corticosteroids (72.2 vs. 76.0), whereas patients who were taking biological had higher Overall satisfaction than patients who were not (78.0 vs. 72.6). Patients who used the internet as the main source of information on IBD had lower Overall satisfaction than patients who used other sources such as a gastroenterologist, a general practitioner, a nurse, or other patients. Overall satisfaction decreased

significantly with the average waiting time for an outpatient visit. Patients who had made a complaint about the IBD service had significantly lower Overall satisfaction than patients who had not (54.4 vs. 75.8).

In multivariate analysis, the variables with a significant association with Overall satisfaction were unemployment situation, involvement of the small joints, number of relapses during the previous year, biological treatment, main source of information on IBD, average outpatient waiting time, and complaints.

Discussion

In this study, we evaluated IBD patient satisfaction with healthcare using SEM. Our final model provided a substantial explanation for Overall satisfaction. The main determinants of Overall satisfaction were Image, Outpatient care, Overall quality, and Medical staff. We also found that the mean index of Overall satisfaction of Portuguese IBD patients was good, with most patients rating the Overall satisfaction as good or very good.

Because of the complexity of the patient satisfaction concept, there is no consensus on the best method to measure it. As patient satisfaction is a multidimensional concept and both a dependent and an independent variable, SEM is likely the methodology of choice for assessment of patient satisfaction for several reasons: first, it enables the simultaneous modeling of relationships among multiple independent and dependent constructs; second, it enables the construction of unobservable variables measured by indicators; and finally, it enables explicit modeling of measurement errors for the observed variables [12, 13,28]. Most studies evaluating patient satisfaction use a descriptive approach, which is based on the determination of correlation coefficients or factorial or cluster analysis. This approach, however, provides very little information on the nature of the relationship between variables, thus limiting the practical utility of the results.

Some instruments have already been developed to measure satisfaction with healthcare among patients with IBD. The treatment satisfaction questionnaire for CD [34], for example, aims to measure the degree of patient satisfaction with pharmacologic therapy in patients with CD. However, the QUOTE-IBD questionnaire aims to measure the quality of care 'through the eyes of patients with IBD' [35]. However, it should be noted that the first of these instruments focuses primarily on pharmacological treatment in CD, whereas the second involves a rather complex procedure of measuring the importance of specific aspects of healthcare before asking the patient to assess the performance of their healthcare provider on each of those aspects of care. Only one previous study has evaluated overall IBD patient satisfaction as the main objective (CACHE questionnaire) [3]. However, in this study, Casellas *et al.* [3] have evaluated patient satisfaction using a descriptive and an exploratory approach. Using a literature review, a focus group with clinical experts, and administration of a provisional version to a small group of patients with IBD, Casellas *et al.* [3] developed and validated the CACHE questionnaire to measure satisfaction with healthcare in patients with IBD. The final version of the CACHE questionnaire included 31 items and factor analysis showed six factors (staff care, clinician care,

Table 4. Analysis of Overall satisfaction according to the sociodemographic and clinical characteristics of patients

Parameters	Overall satisfaction [mean (SD)]	Univariate analysis ^a (<i>P</i> value)	Multivariate analysis ^b [β (95% CI)]
Age	74.4 (20.2)	0.032	0.165 (−0.030 to 0.2369)
Sex		0.082	
Highest level of education			
No formal education/primary	78.7 (21.6)*	0.026*	Ref
Secondary	75.4 (19.3)		−0.693 (−5.878 to 4.492)
University	72.8 (19.2)		−1.102 (−6.858 to 4.653)
Postgraduation	68.4 (23.7)*		−2.659 (−9.879 to 4.561)
Employment situation			
Employed	72.2 (20.7)*	0.027*	Ref
Unemployed	80.2 (16.9)*		7.956 (2.963 to 12.948)
Student	78.2 (14.7)		6.730 (−1.792 to 15.252)
Pensioner	77.8 (20.3)		−0.096 (−6.598 to 6.406)
Housekeeper	75.3 (26.0)		−4.010 (−14.641 to 6.622)
Place of residence	–	0.356	–
Level of hospital differentiation	–	0.182	–
Smoking	–	0.697	–
Type of disease	–	0.199	–
Evolution since diagnosis	–	0.655	–
Disease activity [<i>n</i> (%)]			
In remission	76.0 (19.1)	0.015	Ref
Active	71.4 (21.9)		−0.690 (−4.848 to 3.467)
Disease location [<i>n</i> (%)]			
Stomach (yes vs. no)	64.4 (20.6) vs. 75.2 (19.7)	0.014	−7.593 (−15.646 to 0.459) ^c
Small bowel (yes vs. no)	–	0.100	–
Large bowel (yes vs. no)	–	0.679	–
Rectum (yes vs. no)	–	0.138	–
Extraintestinal manifestations (yes vs. no)	–	0.080	−3.931 (−7.648 to −0.213) ^c
Type of extraintestinal manifestations			
Cutaneous (yes vs. no)	–	0.248	–
Ocular (yes vs. no)	–	0.569	–
Axial (yes vs. no)	–	0.583	–
Articular (large joints) (yes vs. no)	–	0.477	–
Articular (small joints) (yes vs. no)	70.7 (21.9) vs. 75.9 (19.3)	0.008	–
Number of relapses during the previous year			
0	78.4 (17.8)*	0.002*	Ref
1–2	70.8 (20.4)*		−5.823 (−10.871 to −0.774)
3–4	73.6 (22.6)		−3.514 (−10.307 to 3.279)
≥ 5	74.7 (22.3)		−2.740 (−9.685 to 4.204)
Time since last relapse (months)			
0–3	71.6 (21.4)**	0.015**	Ref
4–12	76.2 (18.7)*		−0.336 (−5.198 to 4.526)
> 12	79.6 (19.1)**		2.508 (−4.300 to 9.316)
Number of hospitalizations	–	0.390	–
Medication			
Oral 5-ASA (yes vs. no)	72.2 (21.6) vs. 76.0 (19.1)	0.678	−2.999 (−6.651 to 0.653) ^c
Topic 5-ASA (yes vs. no)	78.0 (18.3) vs. 72.6 (21.0)	0.238	7.821 (4.117 to 11.525) ^c
Systemic corticosteroid (yes vs. no)	–	0.038	–
Topic corticosteroid (yes vs. no)	–	0.078	–
Immunosuppressor (yes vs. no)	–	0.797	–
Biological (yes vs. no)	–	0.005	–
Number of surgeries	–	0.753	–
Main source of information about IBD		< 0.001*	
Internet	61.1 (22.3)**	0.029**	−4.775 (−8.680 to −0.870)
Gastroenterologist	76.2 (18.9)*		−0.514 (−4.107 to 3.079)
APDI	69.2 (25.4)		−0.711 (−4.374 to 2.952)
GP/nurse/other patients	77.3 (16.5)**		Ref
Means of urgent contact with specialist	–	0.287	–
Number of outpatient visits per year	–	0.284	–
Average waiting time in the outpatient clinic (min)			
0–30	78.9 (18.3)*	< 0.001*	Ref
30–60	74.4 (20.0)		−2.196 (−5.919 to 1.527)
> 60	65.8 (22.1)*		−10.322 (−15.123 to −5.628)
Psychology outpatient clinic (yes vs. no)	–	0.256	–
Nutrition outpatient clinic (yes vs. no)	–	0.300	–
Complaints (yes vs. no)	54.4 (22.0) vs. 75.8 (19.4)	< 0.001	−17.678 (−24.662 to −10.694) ^c

We present the mean Overall satisfaction only for variables with a significant association with Overall satisfaction.

5-ASA, 5-aminosalicylic acid; APDI, Association of Portuguese Patients with IBD; GP, general practitioner; IBD, inflammatory bowel disease.

^aIn univariate analysis, linear regression and one-way ANOVA (with Tukey's HSD post-hoc test) were used for continuous and categorical independent variables, respectively.

^bOnly variables with a significant association with Overall satisfaction in univariate analysis were used for multivariate analysis, which was carried out using multiple regression.

^cNo was used as a reference.

* and ** indicate the groups that differ significantly in one-way ANOVA (with Tukey's HSD post-hoc test).

facilities, information, center accessibility, and support received), which explained 56% of variance. There were no statistically significant correlations between the overall score and sociodemographic and clinical variables, but there was a statistically significant correlation between the time spent in the waiting room and the item measuring satisfaction with that aspect.

Our final SEM model provided a substantial explanation for Overall satisfaction, explaining 82% of its variance. This value-explanatory capacity compares very favorably with the results of other studies that had evaluated non-IBD patient satisfaction using a similar methodology [11,19]. It is also clearly superior to the study of Casellas *et al.* [3] (56%). LV with a statistically significant influence on Overall satisfaction were, in descending order of path coefficient, Image, Outpatient care, Overall quality, Medical staff, Inpatient care, Facilities, and Treatment. These results are in line with previous studies that have evaluated patient satisfaction with healthcare in Portugal using a similar methodology and that have showed that Image, Overall quality, and Medical staff are the three main determinants of Overall satisfaction [29,30].

This is also the first study evaluating Portuguese IBD patient satisfaction, which can be used as an indicator of the quality of care for IBD patients in Portugal. This is important as no data exist on the organization and quality of care for Portuguese IBD patients, although it is assumed that they may be quite variable across regions and hospitals. In our study, the mean index of Overall satisfaction was good (74), with most patients (78%) rating the Overall satisfaction as good or very good. These results are, however, slightly worse than those of other studies evaluating customer and patient satisfaction, showing that there is room for improvement. Recognizing the need for improvement of quality of care, the GEDII is currently developing a project to define a quality of care model for IBD patients. All LV had a predominantly good or very good evaluation. Nonetheless, Inpatient care was the variable with the worst score between the 13 LVs. Interestingly, we did find any association between Overall satisfaction and the place of residence or the level of differentiation of hospitals, suggesting that the quality of care does not vary significantly across regions and hospitals.

Overall satisfaction was similar in patients with CD or UC, which is in line with the study of Casellas *et al.* [3]. Nonetheless, we noted differences in Overall satisfaction related to other sociodemographic and clinical patients' characteristics. Namely, Overall satisfaction was lower in employed patients, patients with involvement of the small joints, patients with relapses during the previous year, patients not receiving treatment with biological, patients who use the internet as the main source of information on IBD, patients with a high average waiting time for an outpatient visit, and patients who had made any complaint about the health service. These data suggest that patients with severe or active disease, patients with professionally active situation, and patients who actively seek information on IBD are not receiving the care they need. These are the patients who deserve increased attention to improve their Overall satisfaction. The study by Casellas *et al.* [3] also showed a significant association between IBD patient satisfaction and the average waiting time for an outpatient visit, suggesting that every effort should be made to reduce

the waiting time for an outpatient visit to increase IBD patients' satisfaction.

By combining the mean indices of LV and their impact on the Overall satisfaction, the methodology that was used in this work enabled us to identify the areas that should be targeted by the IBD services to improve Overall satisfaction. Outpatient care was highlighted as the primary priority of IBD services as it has a low mean index and a high impact on Overall satisfaction. To improve satisfaction with Outpatient care, IBD services should focus on reducing the average waiting time for an outpatient visit. Following Outpatient care, Facilities and Inpatient care were the secondary priorities of IBD services. To improve satisfaction with Facilities and Inpatient care, IBD services should focus on the protection of privacy and the quality of meals, respectively.

This study has some weaknesses. It was limited to APDI members and patients who were treated in public hospitals. This may have led to overestimation of Overall satisfaction because these patients are likely the most satisfied ones, and this also limits the extrapolation of the results to patients who are not members of APDI or are treated in private hospitals. The low rate of respondents (25%) may also limit the representativeness of the data. Finally, this study was limited to Portuguese patients. This limits the extrapolation of the results to patients of other countries with different sociocultural characteristics as these aspects may influence patient satisfaction [8,36].

In conclusion, this is the first study evaluating IBD patient satisfaction with healthcare using SEM. This methodology enabled us to create a model that can explain a considerable proportion of variability in the overall IBD patient satisfaction. It also enabled us to identify the areas that should be targeted by the IBD services to improve Overall satisfaction. This is also the first study evaluating IBD patient satisfaction with healthcare in Portugal. In Portugal, overall IBD patients' satisfaction is good, but to increase this, IBD services need to focus on improving Outpatient care, Facilities, and Inpatient care, especially in some sets of patients. Future studies should evaluate the evolution of satisfaction of Portuguese IBD patients and determine whether the model that was used in this work can be used for other groups of IBD patients and other countries.

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Conflicts of interest

There are no conflicts of interest.

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