

ORIGINAL ARTICLE

Symptoms and seeking supportive care and associations with quality of life after treatment for colon cancer: Results from the I CARE cohort study

Laura Anna Mieneke Duineveld¹  | Thijs Wieldraaijer¹ | Marc J. P. M. Govaert² |
Wim B. Busschers¹ | Jan Wind¹ | Kristel M. van Asselt¹ | Henk C. P. M. van Weert¹

¹Department of Primary Care, Amsterdam UMC, location AMC, Amsterdam, The Netherlands

²Department of Surgery, Dijklander Hospital, Hoorn, The Netherlands

Correspondence

Laura Anna Mieneke Duineveld, Department of Primary Care Amsterdam UMC, University of Amsterdam, Post Box 22660, Amsterdam 1100 DD, The Netherlands.

Email: l.a.duineveld@amsterdamumc.nl

Funding information

KWF Kankerbestrijding/Alpe d'HuZes, Grant/Award Number: BMA 5954

Abstract

Objective: Patients treated for colon cancer report many symptoms that affect quality of life (QoL). Survivorship care aims at QoL improvement. In this study, we assess associations between symptoms and seeking supportive care and lower QoL and QoL changes overtime during survivorship care.

Methods: A prospective cohort of colon cancer survivors. Questionnaires are administered at inclusion and 6 months later to evaluate symptoms, functioning and seeking supportive care including associations with QoL, using the EORTC QLQ-C30.

Results: The mean QoL score at the first questionnaire was 82 (scale 1–100), which improved over time. Pain, bowel symptoms and problems in physical, role, cognitive or social functioning are associated with lower QoL at inclusion but are not associated with QoL changes over time. Seeking support for lower bowel symptoms, physical functioning or fatigue is associated with lower QoL. After 6 months, seeking support for upper bowel symptoms or physical functioning is associated with a tendency towards less QoL improvement.

Conclusion: QoL of colon cancer survivors improves over 6 months, but seeking support for specific symptoms barely contribute to this improvement.

Implications: This study confirms the importance of addressing symptoms, problems related to functioning and seeking supportive care during survivorship care.

KEYWORDS

cancer survivors, colorectal cancer, quality of life, supportive care

1 | INTRODUCTION

The purpose of colon cancer survivorship care following treatment with curative intent is early detection of recurrences, identification of long-term effects of treatment and cancer itself and rehabilitation in order to improve quality of life (QoL) (Health Council of the

Netherlands, 2007). Survivorship care in the Netherlands is organised in secondary care for a period of 5 years after treatment.

Colon cancer survivors often report fatigue and bowel symptoms (O'Gorman et al., 2018; Walling et al., 2015; Wieldraaijer et al., 2017). Micturition-related symptoms (O'Gorman et al., 2018; Wieldraaijer et al., 2017), insomnia (O'Gorman et al., 2018) and depressive

This is an open access article under the terms of the [Creative Commons Attribution-NonCommercial](https://creativecommons.org/licenses/by-nc/4.0/) License, which permits use, distribution and reproduction in any medium, provided the original work is properly cited and is not used for commercial purposes.

© 2022 The Authors. *European Journal of Cancer Care* published by John Wiley & Sons Ltd.

symptoms are common as well (Walling et al., 2015). Although colon cancer survivors report a good QoL (Arndt et al., 2004, 2006; Russell et al., 2015), the presence of frequently reported symptoms concerning bowel functioning, fatigue, distress, anxiety and depression is known to be associated to lower QoL (Bours et al., 2016; Chambers et al., 2012; Marventano et al., 2013).

In line with previous findings, our study group found that colon cancer survivors report many symptoms during survivorship care. We concluded that only a small proportion of patients with symptoms seek help, with fewer patients seeking help for psychosocial symptoms than for physical symptoms (Wieldraaijer et al., 2017). While most symptoms are reported shortly after finishing treatment for colon cancer (Russell et al., 2015; Walling et al., 2015; Wieldraaijer et al., 2017), chronic bowel problems, fear of recurrence and depression can persist for a long period, even after 5 years (Jansen et al., 2010).

Research on symptoms affecting QoL over time is limited. With this information, caregivers could be more alert on specific symptoms and the possible risk of undertreatment of these symptoms during survivorship care. The correlation of seeking supportive care for specific symptoms and functioning with QoL is largely unknown as well. Insight into these correlations could help caregivers to better understand the meaning of these symptoms for patients and guide them to targeted personalised interventions. This study investigates which physical, psychological and social symptoms and problems in functioning in patients enrolled in colon cancer survivorship care are associated with lower QoL. We will assess how the presence of these symptoms and problems in functioning are associated with QoL changes after 6 months. Furthermore, we prospectively investigate associations between seeking supportive care and lower QoL and QoL changes over time.

2 | METHODS

2.1 | Study design and setting

This is a multicentre prospective cohort study among patients treated for colon cancer, included in scheduled follow-up and survivorship care in a hospital setting. Patients were asked to complete two questionnaires, one at inclusion and one 6 months later. The inclusion period was November 2013 until January 2015. Results of the baseline questionnaire have been published earlier, in which the causes of distress and supportive care needs have been analysed by a single questionnaire (Wieldraaijer et al., 2017). In the current study, we assess how these symptoms and seeking supportive care are associated with QoL at inclusion and changes in QoL after 6 months.

2.2 | Participants

Patients who were treated for colon cancer stages I–III with curative intent (including adjuvant chemotherapy) were eligible. Patients could

be included at any moment during their 5-year scheduled follow-up period. Exclusion criteria were hereditary colon cancer, history of inflammatory bowel disease, rectal cancer, (sub) total colectomy, history of other cancer or conditions that warranted specialist care or increased intensity of surveillance. Patients were recruited and received verbal and written study information during a routine follow-up visit at the outpatient clinic of one of six Dutch hospitals.

2.3 | Data collection

Participants were asked to complete an electronic or paper questionnaire within 1 week after inclusion. We used the online survey program Survey Monkey for data collection. The first survey contained questions about marital status, educational level, pre-illness work status and comorbidity. Cancer characteristics, additional information on comorbid conditions and treatment details were collected from participants' hospital and general practice records. Patients' symptoms, seeking supportive care and QoL items were collected at inclusion and 6 months after inclusion by identical questionnaires. The questionnaires included 67 questions on symptoms and functioning and two items on global health status and were based on existing validated questionnaires: the European Organization for Research and Treatment of Cancer QLQ-C30 (EORTC QLQ-C30) (Aaronson et al., 1993), the EORTC QLQ-CR29 (Whistance et al., 2009), the Short Questionnaire to assess Health-Enhancing Physical Activity (SQUASH) (Wendel-Vos et al., 2003), the Functional Assessment of Cancer Therapy-Colorectal Quality of Life instrument (FACT-C) (Ward et al., 1999), the Distress Thermometer (Tuinman et al., 2008) and the Gastrointestinal Quality of Life Index (GIQLI) (Eypasch et al., 1995). Questions were scored on a 4-point Likert scale, ranging from 'not at all' (1) to 'very much' (4) that applied to the previous week. If the participant scored the presence of a symptom (cut-off > 1 point), additional questions were asked to assess whether there was a need for supportive care and if he/she did seek support for this symptom.

In the current study, scoring was done according to the EORTC QLQ-C30 and QLQ-CR29 scoring manuals, in which questions are defined into symptom scales, functional scales or single items (Aaronson et al., 1993; Whistance et al., 2009). Items of other questionnaires mentioned above were incorporated into these scales (Appendix A). Data of scales were dichotomised. We handled a score above 1 to indicate the presence of any item of a scale. The same was done for seeking supportive care, meaning that a score of 1 indicated that a patient sought supportive care for any item of a scale. Also questions were asked where patients asked for help (open field) and whether they were content with it, scored on a 5-point Likert scale, ranging from 'very dissatisfied' (1) to 'very satisfied' (5). For patients with a stoma, items on bowel-related scales were considered similarly as for patients without a stoma, according to the EORTC QLQ-CR29. We calculated the summary score of the EORTC QLQ-C30 from the mean of 13 QLQ-C30 scales to represent the overall QoL (scale 0–100) (Giesinger et al., 2016). Missing items on the EORTC scales were managed according to the scoring manual (Fayers et al., 2001). The

summary score could only be calculated if all 13 scores were available. In accordance with previous studies, we considered a minimal difference of 10 points in EORTC QLQL-C30 score to be clinically meaningful (Osoba et al., 1998).

2.4 | Statistics

Data were analysed using SPSS Statistics version 25.0 and R version 3.6.1. We used Chi-square tests and independent sample *T* tests for descriptive statistics. Our primary outcome measure was the summary EORTC QLQ-C30 score at inclusion and the QoL change after 6 months.

We used linear regression models to assess associations of symptom, functioning and seeking supportive care with QoL at inclusion and change in QoL after 6 months. In these analyses, all completed questionnaires were included, and possible confounding patient and disease characteristics were assessed with interaction terms (gender, age, living situation, employment status, educational attainment, comorbidity, stoma, recurrent disease, time after surgery at inclusion, adjuvant chemotherapy). First, models were fitted for each symptom scale and functional scale separately, as shown in Appendix A, to examine associations with the QoL score at inclusion. The scales with a *p* value up to 0.2 were selected for the multi-variable linear regression model with backward selection to identify which scales were important in explaining the QoL score at inclusion. Identified scales were used in a subsequent model to assess how these items of the scales affected QoL changes after 6 months where the QoL score at inclusion was considered as a possible confounding variable. Secondly, we assessed associations between seeking supportive care for symptoms and functioning and QoL at inclusion. We fitted models of symptom scales and functional scales for which patients seek support with at least 10 observations. Scales with a *p* value up to 0.2 were included in a multi-variable linear model with backward selection. Subsequently, identified scales were included in a last model to investigate associations with QoL changes after 6 months, with the QoL score at inclusion as possible confounder. Estimated regression coefficients, standard errors and *p* values with 95% confidence intervals are reported.

3 | RESULTS

Of 491 eligible patients, 284 agreed to participate. Reasons for patients to decline have been described before (Wieldraaijer et al., 2017). All 13 scores needed to calculate the QoL summary score of the first questionnaire were available from 197 patients. These 197 participants had a mean age of 67 years, and 47% were women. Median time after surgery at inclusion was 7 months (interquartile range [IQR] 4–13) (Table 1). Non-participants were on average older than participants ($n = 294$, 71 vs. 67 years, $p < 0.001$) but otherwise had similar characteristics. At inclusion, participants had at least one symptom, and a median of 23 symptoms per patient were reported

($n = 197$, IQR 14–31). The mean summary QoL score at inclusion was 81.9 (SD 13.0). Six months after inclusion, 152 participants completed the second questionnaire. Patient characteristics were comparable to the 45 non-responders. The mean QoL score was 87.8 (SD 9.5) and improved by 5.6 points in 6 months ($n = 152$, SD 10.5).

3.1 | Symptoms and functional problems associated with lower QoL and QoL changes after 6 months

Table 2 shows symptom scales and functional scales that were associated with QoL at inclusion. Having pain ($n = 102$), upper ($n = 55$) or lower ($n = 124$) gastrointestinal (GI) tract symptoms was associated with a lower QoL score compared to similar patients without these symptoms (minus 5.6, 8.0 and 5.4 points in QoL score, respectively). Upper GI tract symptoms included nausea and vomiting, and lower GI tract symptoms contained blood or mucus in stool and altered bowel habits (Appendix A). Problems related to functioning (physical [$n = 138$], role [$n = 90$], cognitive [$n = 116$] or social functioning [$n = 120$]), were also associated with a lower QoL score compared to similar patients without these problems (minus 3.2, 5.5, 6.0 and 6.5 points in QoL score, respectively). Role functioning concerned the ability to do daily and leisure time activities like work and hobbies (Appendix A). Adjustments for age, time after surgery and chemotherapy did not significantly influence QoL. Symptom scales and functional scales and their unadjusted association with QoL at inclusion are shown in Appendix B.

The identified scales were included in a subsequent model to analyse associations of different items of the scales with QoL changes after 6 months. The model was extended with an interaction term between chemotherapy and QoL at inclusion due to its significance level and medical relevance. After 6 months, patients with QoL scores lower than the QoL mean score at inclusion attained more improvement than those with higher scores (keeping other variables constant) (Table 2). Patients who had chemotherapy and on average lower QoL scores at inclusion showed a tendency towards more QoL improvement after 6 months. No clinically meaningful differences of 10 points in QoL score were seen. The presence of upper GI tract symptoms or problems in physical functioning at inclusion is weakly associated with less QoL improvement after 6 months. Adjustments were made for age, time after surgery, chemotherapy and QoL at inclusion.

3.2 | Seeking supportive care and associations with lower QoL and QoL changes after 6 months

Symptoms and functioning for which support was sought with at least 10 observations included GI-related symptoms, physical functioning, pain, fatigue, unspecified psychological functioning and chemotherapy-related symptoms (Appendix A). Patients who sought support for the lower GI tract symptoms ($n = 34$), fatigue ($n = 19$) or physical functioning ($n = 13$) had clinically significantly lower QoL

TABLE 1 Patients' characteristics

	Participants (n = 197)	Non-participants (n = 294)	p value
Age (years, mean, SD)	67 (9.9)	71 (10.6)	<0.001*
Gender (female, n %)	93 (47)	147 (50)	0.54
Time after surgery (months, median, IQR)	7 (IQR 4–13)	6 (IQR 3–12)	0.11
Tumour stage ^a (%)			0.72
I	48 (24)	69 (24)	
II	72 (37)	118 (40)	
III	77 (39)	107 (36)	
Patients treated with adj. CTx, n (%)	69 (35)	102 (35)	0.94
Currently treated with adj. CTx, n (%)	27 (14)	53 (18)	0.20
Completed survey after 6 months, n (%)	152 (54)		
Recurrent disease during study, n (%)	12 (6)		
Time to recurrent disease ^b (months, median, IQR)	11 (6–20)		
Died during study, n (%)	5 (3)		
Time to death ^c (months, median, IQR)	17 (10–27)		
Living situation (living together, n %)	149 (76)		
Employment status (inactive, n %)	147 (75)		
Educational attainment, n (%)			
Primary or none	10 (5)		
Secondary	112 (57)		
Vocational education	54 (27)		
University	21 (11)		
Chronic comorbid condition ^d , n (%)	129 (66)		
Stoma, n (%)	21 (11)		

Abbreviations: adj. CTx, adjuvant chemotherapy; IQR, interquartile range; SD, standard deviation.

^aTumour stage was defined using the TNM5 criteria (Sobin & Fleming, 1997).

^bTime after surgery to detection of recurrent disease.

^cTime after surgery to death.

^dNumber of patients with at least one comorbid condition; most prevalent comorbid conditions were cardiovascular disease (44%), musculoskeletal disorders (15%), diabetes mellitus (13%), urologic disorders (10%) and asthma/COPD (9%).

* $p < 0.001$.

scores at inclusion compared to the reference (minus 9.2, 9.6 and 11.7 points in QoL score respectively, $p < 0.001$) (Table 3). Corrections were made for gender, age, time after surgery and chemotherapy. If supportive care was sought for physical functioning or upper GI tract symptoms, a tendency towards less QoL improvement was seen after 6 months compared to the reference (Table 3). Adjustments for gender, age, time after surgery, chemotherapy and QoL at inclusion were made, and an interaction term was added between chemotherapy and QoL at inclusion. In patients who sought supportive care for lower GI tract symptoms or fatigue, a trend towards more QoL improvement was seen (additional change of 3.8 and 4.8 points in QoL score, respectively).

Patients who sought support for physical functioning asked paramedics (54%), family and friends (31%), general practitioners (GPs) (15%) or specialists (8%) for support. When support was sought for GI tract symptoms or fatigue, most patients consulted GPs or specialists. On average, patients were satisfied to very satisfied with support they received (Table 4).

4 | DISCUSSION

In this study, we analysed which symptoms and problems related to functioning were associated with QoL and QoL changes after 6 months of patients who have been treated with curative intent for colon cancer. In addition, we assessed associations of seeking supportive care with QoL and changes in QoL.

4.1 | Main findings

Patients treated for colon cancer, with a median time after surgery of 7 months, had a mean QoL score of 82. Pain, upper and lower GI tract symptoms or problems in physical, role, cognitive or social functioning were associated with to a lower QoL, regardless the time after surgery. If supportive care was sought for lower GI tract symptoms, physical functioning or fatigue, QoL scores were worse. After 6 months, most patients showed QoL improvements. Patients who sought

TABLE 2 Results of the linear regression model for symptom scales and functional scales associated with the summary quality of life scores at inclusion and change in quality of life scores after 6 months

Variables	Quality of life scores at inclusion (n = 197)				Change in quality of life scores after 6 months (n = 152)			
	Coefficient	SE	p value	95% CI	Coefficient	SE	p value	95% CI
Intercept	103.14 ^a	1.17	<0.001**	100.83 to 105.45	9.56 ^b	2.64	<0.001**	4.34 to 14.78
Age ^c	-0.11	0.05	0.03*	-0.22 to -0.01	0.10	0.07	0.15	-0.04 to 0.23
Time after surgery (months) ^d	0.08	0.05	0.15	-0.03 to 0.18	-0.01	0.07	0.95	-0.15 to 0.14
Chemotherapy	-1.57	1.14	0.17	-3.82 to 0.68	0.86	1.47	0.56	-2.04 to 3.77
Quality of life at inclusion ^e	-	-	-	-	-0.63	0.11	<0.001**	-0.86 to -0.41
Quality of life at inclusion * Chemotherapy ^f	-	-	-	-	-0.22	0.11	0.06	-0.44 to 0.01
Symptom scale								
Pain	-5.56	1.08	<0.001**	-7.69 to -3.43	0.48	1.47	0.75	-2.44 to 3.39
Upper gastrointestinal tract	-8.00	1.20	<0.001**	-10.37 to -5.63	-2.86	1.76	0.11	-6.34 to 0.61
Lower gastrointestinal tract	-5.40	1.07	<0.001**	-7.51 to -3.29	-0.51	1.45	0.73	-3.37 to 2.36
Functional scale								
Physical functioning	-3.18	1.26	0.01*	-5.67 to -0.69	-2.56	1.59	0.11	-5.71 to 0.59
Role functioning	-5.52	1.16	<0.001**	-7.80 to -3.24	-0.80	1.62	0.62	-4.01 to 2.41
Cognitive functioning	-5.98	1.07	<0.001**	-8.10 to -3.86	-1.29	1.47	0.38	-4.20 to 1.61
Social functioning	-6.53	1.16	<0.001**	-8.81 to -4.25	-1.06	1.65	0.52	-4.32 to 2.19

Abbreviations: CI, confidence interval; SE, standard error.

^aEstimated quality of life summary scores of a patient, aged 67 years, average time after surgery, no chemotherapy treatment and no symptoms concerning pain, the upper and lower gastrointestinal tract, physical functioning, role functioning, cognitive functioning and social functioning (reference).

^bEstimated change in quality of life summary scores of a patient, aged 67 years, average time after surgery, no chemotherapy treatment, with an average quality of life score at inclusion, and no symptoms concerning pain, the upper and lower gastrointestinal tract, physical functioning, role functioning, cognitive functioning and social functioning (reference).

^cAge = (Age - 67 years).

^dTime after surgery = (Time after surgery - 7 months).

^eQuality of life at inclusion = (Quality of life score - 81.9).

^fThe model includes an interaction term between the average quality of life score at inclusion and treatment with chemotherapy.

* $p < 0.05$. ** $p < 0.001$.

support for upper GI symptoms or physical functioning reported a slightly lower QoL improvement after 6 months (both $p = 0.03$), whereas in patients who sought support for fatigue and lower GI tract symptoms, a tendency towards more QoL improvement was seen ($p = 0.04$ and $p = 0.08$, respectively).

4.2 | Comparison to previous literature

Our patients had a mean QoL score of 82, which is worse compared to the Dutch general population (mean summary QoL score 93.3 and 89.3 for men and women, respectively, aged 60–69 years) (Mols et al., 2018). We found that having any symptom concerning pain, the upper or lower GI tract or a problem regarding physical, role, cognitive or social functioning was associated with lower QoL, regardless of the time after surgery. These associations with lower QoL are consistent with previous studies (Bours et al., 2016; Gray et al., 2011; Pan & Tsai, 2012; Steginga et al., 2009) but also associations with depressive

symptoms and fatigue have been reported before (Bours et al., 2016; Chambers et al., 2012; Gray et al., 2011; Marventano et al., 2013; Wilson et al., 2006). Inclusion of patients with metastatic disease and/or rectal cancer in these previous studies and a higher number of patients treated with additional chemotherapy compared to our population could be explanatory. Symptoms reported at inclusion were not associated with clinically relevant QoL changes after 6 months. Less QoL improvement was seen among patients who had higher QoL scores at inclusion. This may be explained by the 'ceiling effect' in which a patient with a higher QoL score at inclusion is less likely to report QoL improvement over time. This is further supported by the fact that symptoms showed no clinically meaningful associations with QoL after 6 months.

Seeking supportive care for fatigue, lower GI tract symptoms or physical functioning was associated with lower QoL scores at inclusion. After 6 months, patients who sought support for upper GI tract symptoms or physical functioning reported lower QoL. Seeking support can be a proxy of many issues, for example, influences on daily

TABLE 3 Results of the linear regression model for symptom scales and functional scales for which patients sought supportive care associated with the summary quality of life scores at inclusion and change in quality of life scores after 6 months

Variables	Quality of life scores at inclusion (n = 197)				Change in quality of life scores after 6 months (n = 152)			
	Coefficient	SE	p value	95% CI	Coefficient	SE	p value	95% CI
Intercept	85.77 ^a	1.18	<0.001***	83.45 to 88.10	4.09 ^b	1.07	<0.001***	1.99 to 6.20
Gender (male)	4.14	1.37	0.003**	1.43 to 6.85	1.49	1.27	0.24	-1.02 to 4.01
Age ^c	0.12	0.07	0.11	-0.02 to 0.26	0.12	0.06	0.06	-0.01 to 0.24
Time after surgery (months) ^d	0.27	0.07	<0.001***	0.13 to 0.42	-0.01	0.07	0.90	-0.15 to 0.13
Chemotherapy	-5.37	1.50	<0.001***	-8.33 to -2.41	0.41	1.39	0.77	-2.33 to 3.15
Quality of life at inclusion ^e	-	-	-	-	-0.45	0.07	<0.001***	-0.60 to -0.30
Quality of life at inclusion * chemotherapy ^f	-	-	-	-	-0.26	0.11	0.02*	-0.48 to -0.04
Sought supportive care for								
Upper gastrointestinal tract	-4.29	3.17	0.18	-10.55 to 1.96	-6.50	2.92	0.03*	-12.28 to -0.72
Lower gastrointestinal tract	-9.22	2.19	<0.001***	-13.53 to -4.91	3.84	2.20	0.08	-0.50 to 8.18
Unspecified gastrointestinal	-4.37	2.42	0.07	-9.15 to 0.41	0.70	2.14	0.75	-3.54 to 4.93
Fatigue	-9.56	2.68	<0.001***	-14.85 to -4.27	4.79	2.35	0.04*	0.14 to 9.44
Sought supportive care for								
Physical functioning	-11.73	3.05	<0.001***	-17.74 to -5.72	-5.94	2.75	0.03*	-11.37 to -0.50

Abbreviations: CI, confidence interval; SE, standard error.

^aEstimated quality of life summary score of a female patient, aged 67 years, average time after surgery, no chemotherapy treatment and no supportive care sought for the upper and lower gastrointestinal tract, unspecified gastrointestinal symptoms, fatigue and physical functioning (reference).

^bEstimated change in quality of life summary score of a female patient, aged 67 years, average time after surgery, no chemotherapy treatment, with an average quality of life score at inclusion, and no supportive care sought for the upper and lower gastrointestinal tract, unspecified gastrointestinal symptoms, fatigue and physical functioning (reference).

^cAge = (Age - 67 years).

^dTime after surgery = (Time after surgery - 7 months).

^eQuality of life at inclusion = (Quality of life score - 81.9).

^fThe model includes an interaction term between the average quality of life score at inclusion and treatment with chemotherapy.

* $p < 0.05$. ** $p < 0.01$. *** $p < 0.001$.

TABLE 4 Supportive care consultation per symptom scale and functional scale

Sought supportive care for	n	GP		Hospital		Paramedic/homecare		Informal support ^a		>1 resource ^b		Satisfaction ^c
		n	(%)	n	(%)	n	(%)	n	(%)	n	(%)	Mean, range
Upper gastrointestinal tract	12	3	(25%)	10	(83.3%)	1	(8.3%)	0		2	(16.7%)	3.8 (2-5)
Lower gastrointestinal tract	34	19	(55.9%)	19	(55.9%)	0		0		8	(23.5%)	4.1 (1-5)
Unspecified gastrointestinal	26	10	(38.5%)	23	(88.5%)	0		0		8	(30.8%)	4.0 (1-5)
Fatigue	19	12	(63.2%)	12	(63.2%)	4	(21.1%)	4	(21.1%)	8	(42.1%)	3.7 (1-5)
Physical functioning	13	2	(15.4%)	1	(7.7%)	7	(53.8%)	4	(30.8%)	3	(23.1%)	4.0 (2-5)

^aInformal support includes help from family and friends.

^bMultiple answers could be given. Total percentages could exceed 100.

^cSatisfaction 5-point Likert scale, ranging from 'very dissatisfied' (1) to 'very satisfied' (5).

activities, great concern about symptoms (Elnegaard et al., 2017) knowledge and self-efficacy (de Nooijer et al., 2003). These issues have not been assessed in this study but offer cues for further research. Patients most often sought support from GPs and hospitals;

however, we did not investigate the effect of supportive care. Lower GI tract symptoms as altered bowel habits are common, and GPs and medical specialists are familiar with diagnosing and treating bowel symptoms. For (cancer-related) fatigue, effective interventions with

respect to QoL are available (Thong et al., 2020). Based on our findings, additional attention should be paid to patients who express problems related to physical functioning and the upper GI tract, for example, nausea and vomiting, since these were associated with less QoL improvement.

4.3 | Strengths and limitations

To our best knowledge, this is the first study that analysed the associations of symptoms, functioning and seeking supportive care with QoL in patients treated for colon cancer. A limitation of our study was the small number of patients with a stoma and with recurrent disease. Both groups seemed to have a lower QoL compared to patients without these conditions, but subgroup analyses could not be performed. Furthermore, we were not able to investigate the effect of combinations of symptom scales and functional scales on QoL due to insufficient data. Lastly, the number of patients seeking support for some items of the symptom scales and functional scales was low, like for social functioning. Associations with QoL could not be investigated for these items.

4.4 | Implications for practice

Colon cancer patients reported many symptoms during survivorship care. Only a number of symptoms and problems related to functioning were associated with lower QoL. The presence of these symptoms or problems related to functioning showed no meaningful effect on QoL changes after 6 months. However, seeking support for specific symptoms or problems in functioning was associated with either a positive or a negative course on QoL compared to patients who did not sought support for these aspects. These findings confirm the importance of addressing symptoms, problems related to functioning and seeking supportive care during survivorship care. This is further supported by a recent study of Klinkhammer et al., which shows that early detection and tailored treatment of QoL impairments during the first year after colorectal cancer treatment effectively improve QoL, compared to usual care (Klinkhammer-Schalke et al., 2020). A recent development is the evolvement of prediction models to predict the 1-year risk of poor QoL in colorectal cancer patients. For this purpose, Révész et al. used a cohort of colorectal cancer survivors with a mean time of 5 years after colorectal cancer diagnosis. Predictors for overall QoL included patient and tumour characteristics (like chemotherapy, time since diagnosis, stoma and comorbidities) and fatigue, pain, anxiety, depression, stoma-related and chemotherapy-related problems (Revesz et al., 2020). In our cohort, most participants were included during the first year after treatment. Longitudinal data on the first 5 years of survivorship care of colon cancer are needed to determine effects of symptoms, functioning and seeking supportive care on QoL, as in these phase changes in QoL are expected (Revesz et al., 2020).

In conclusion, the mean QoL score of patients during survivorship care for colon cancer is 82 and improves after 6 months. The presence of a symptom was not associated with QoL changes over time, but seeking support for symptoms and functioning did have small positive and negative effects on QoL changes. Health care providers need to be sensitive for seeking supportive care since this study shows the importance of addressing symptoms, problems related to functioning and seeking supportive care during survivorship care.

ACKNOWLEDGEMENTS

The authors would like to acknowledge and thank all the patients who participated in this study. The authors would also like to thank the contributing hospitals: Amsterdam Medical Centre, location AMC (Amsterdam), St. Antonius Hospital (Nieuwegein/Utrecht), Flevo Hospital (Almere), Onze Lieve Vrouwe Gasthuis (Amsterdam), Tergooi Hospitals (Hilversum/Blaricum), Dijklander Hospital, location Hoorn (Hoorn). This study was funded by KWF Kankerbestrijding/Alpe d'HuZes, (BMA 5954).

CONFLICT OF INTEREST

The authors declare to have no conflict of interest.

ETHICS STATEMENT

The Research Ethics Committee of the Academic Medical Centre reviewed the protocol and concluded that an official evaluation by the committee was not required.

DATA AVAILABILITY STATEMENT

Data are available on request from the authors.

ORCID

Laura Anna Mienke Duineveld  <https://orcid.org/0000-0002-4780-9937>

REFERENCES

- Aaronson, N. K., Ahmedzai, S., Bergman, B., Bullinger, M., Cull, A., Duez, N. J., Filiberti, A., Flechtner, H., Fleishman, S. B., de Haes, J. C. J. M., Kaasa, S., Klee, M., Osoba, D., Razavi, D., Rofe, P. B., Schraub, S., Sneeuw, K., Sullivan, M., & Takeda, F. (1993). The European Organization for Research and Treatment of Cancer QLQ-C30: A quality-of-life instrument for use in international clinical trials in oncology. *Journal of the National Cancer Institute*, 85(5), 365–376. Retrieved from <https://www.ncbi.nlm.nih.gov/pubmed/8433390>
- Arndt, V., Merx, H., Stegmaier, C., Ziegler, H., & Brenner, H. (2004). Quality of life in patients with colorectal cancer 1 year after diagnosis compared with the general population: A population-based study. *Journal of Clinical Oncology*, 22(23), 4829–4836. <https://doi.org/10.1200/JCO.2004.02.018>
- Arndt, V., Merx, H., Stegmaier, C., Ziegler, H., & Brenner, H. (2006). Restrictions in quality of life in colorectal cancer patients over three years after diagnosis: A population based study. *European Journal of Cancer*, 42(12), 1848–1857. <https://doi.org/10.1016/j.ejca.2006.01.059>
- Bours, M. J., van der Linden, B. W., Winkels, R. M., van Duijnhoven, F. J., Mols, F., van Roekel, E. H., Kampman, E., Beijer, S., &

- Weijenberg, M. P. (2016). Candidate predictors of health-related quality of life of colorectal cancer survivors: A systematic review. *The Oncologist*, 21(4), 433–452. <https://doi.org/10.1634/theoncologist.2015-0258>
- Chambers, S. K., Meng, X., Youl, P., Aitken, J., Dunn, J., & Baade, P. (2012). A five-year prospective study of quality of life after colorectal cancer. *Quality of Life Research*, 21(9), 1551–1564. <https://doi.org/10.1007/s11136-011-0067-5>
- de Nooijer, J., Lechner, L., & de Vries, H. (2003). Social psychological correlates of paying attention to cancer symptoms and seeking medical help. *Social Science & Medicine*, 56(5), 915–920. [https://doi.org/10.1016/s0277-9536\(02\)00098-9](https://doi.org/10.1016/s0277-9536(02)00098-9)
- Elnegaard, S., Pedersen, A. F., Sand Andersen, R., Christensen, R. D., & Jarbol, D. E. (2017). What triggers healthcare-seeking behaviour when experiencing a symptom? Results from a population-based survey. *BJGP Open*, 1(2), bjgpopen17X100761. <https://doi.org/10.3399/bjgpopen17X100761>
- Eypasch, E., Williams, J. I., Wood-Dauphinee, S., Ure, B. M., Schmulding, C., Neugebauer, E., & Troidl, H. (1995). Gastrointestinal Quality of Life Index: Development, validation and application of a new instrument. *The British Journal of Surgery*, 82(2), 216–222. Retrieved from <https://www.ncbi.nlm.nih.gov/pubmed/7749697>
- Fayers, P. M., Aaronson, N. K., Bjordal, K., Groenvold, M., Curran, D., Bottomley, A., & Group, O. b. o. t. E. Q. o. L. (2001). *The EORTC QLQ-C30 Scoring Manual* (3rd ed.). European Organisation for Research and Treatment of Cancer.
- Giesinger, J. M., Kieffer, J. M., Fayers, P. M., Groenvold, M., Petersen, M. A., Scott, N. W., Sprangers, M. A. G., Velikova, G., Aaronson, N. K., & EORTC Quality of Life Group. (2016). Replication and validation of higher order models demonstrated that a summary score for the EORTC QLQ-C30 is robust. *Journal of Clinical Epidemiology*, 69, 79–88. <https://doi.org/10.1016/j.jclinepi.2015.08.007>
- Gray, N. M., Hall, S. J., Browne, S., Macleod, U., Mitchell, E., Lee, A. J., Johnston, M., Wyke, S., Samuel, L., Weller, D., & Campbell, N. C. (2011). Modifiable and fixed factors predicting quality of life in people with colorectal cancer. *British Journal of Cancer*, 104(11), 1697–1703. <https://doi.org/10.1038/bjc.2011.155>
- Health Council of the Netherlands. (2007). *Follow-up in Oncology. Identify Objectives, Substantiate Actions*. The Hague. Retrieved from <https://www.gezondheidsraad.nl/documenten/adviezen/2007/03/27/nacontrole-in-de-oncologie.-doelen-onderscheiden-inhoud-ouderbouwen>
- Jansen, L., Koch, L., Brenner, H., & Arndt, V. (2010). Quality of life among long-term (>=5 years) colorectal cancer survivors—Systematic review. *European Journal of Cancer*, 46(16), 2879–2888. <https://doi.org/10.1016/j.ejca.2010.06.010>
- Klinkhammer-Schalke, M., Steinger, B., Koller, M., Zeman, F., Furst, A., Gump, J., Obermaier, R., Piso, P., Lindberg-Scharf, P., & Regensburg QoL Study Group. (2020). Diagnosing deficits in quality of life and providing tailored therapeutic options: Results of a randomised trial in 220 patients with colorectal cancer. *European Journal of Cancer*, 130, 102–113. <https://doi.org/10.1016/j.ejca.2020.01.025>
- Marventano, S., Forjaz, M., Grosso, G., Mistretta, A., Giorgianni, G., Platania, A., Gangi, S., Basile, F., & Biondi, A. (2013). Health related quality of life in colorectal cancer patients: state of the art. *BMC Surgery*, 13(Suppl 2), S15. <https://doi.org/10.1186/1471-2482-13-S2-S15>
- Mols, F., Husson, O., Oudejans, M., Vlooswijk, C., Horevoorts, N., & van de Poll-Franse, L. V. (2018). Reference data of the EORTC QLQ-C30 questionnaire: five consecutive annual assessments of approximately 2000 representative Dutch men and women. *Acta Oncologica*, 57(10), 1381–1391. <https://doi.org/10.1080/0284186X.2018.1481293>
- O'Gorman, C., Stack, J., O'Ceilleachair, A., Denieffe, S., Gooney, M., McKnight, M., & Sharp, L. (2018). Colorectal cancer survivors: An investigation of symptom burden and influencing factors. *BMC Cancer*, 18(1), 1022. <https://doi.org/10.1186/s12885-018-4923-3>
- Osoba, D., Rodrigues, G., Myles, J., Zee, B., & Pater, J. (1998). Interpreting the significance of changes in health-related quality-of-life scores. *Journal of Clinical Oncology*, 16(1), 139–144. <https://doi.org/10.1200/JCO.1998.16.1.139>
- Pan, L. H., & Tsai, Y. F. (2012). Quality of life in colorectal cancer patients with diarrhoea after surgery: A longitudinal study. *Journal of Clinical Nursing*, 21(15–16), 2357–2366. <https://doi.org/10.1111/j.1365-2702.2011.04034.x>
- Revesz, D., van Kuijk, S. M. J., Mols, F., van Duijnhoven, F. J. B., Winkels, R. M., Hoofs, H., ... Bours, M. J. L. (2020). Development and internal validation of prediction models for colorectal cancer survivors to estimate the 1-year risk of low health-related quality of life in multiple domains. *BMC Medical Informatics and Decision Making*, 20(1), 54. <https://doi.org/10.1186/s12911-020-1064-9>
- Russell, L., Gough, K., Drosdowsky, A., Schofield, P., Aranda, S., Butow, P. N., Westwood, J. A., Krishnasamy, M., Young, J. M., Phipps-Nelson, J., King, D., & Jefford, M. (2015). Psychological distress, quality of life, symptoms and unmet needs of colorectal cancer survivors near the end of treatment. *Journal of Cancer Survivorship*, 9(3), 462–470. <https://doi.org/10.1007/s11764-014-0422-y>
- Sobin, L. H., & Fleming, I. D. (1997). TNM Classification of Malignant Tumors, fifth edition (1997). Union Internationale Contre le Cancer and the American Joint Committee on Cancer. *Cancer*, 80(9), 1803–1804. Retrieved from <http://www.ncbi.nlm.nih.gov/pubmed/9351551>
- Steginga, S. K., Lynch, B. M., Hawkes, A., Dunn, J., & Aitken, J. (2009). Antecedents of domain-specific quality of life after colorectal cancer. *Psycho-Oncology*, 18(2), 216–220. <https://doi.org/10.1002/pon.1388>
- Thong, M. S. Y., van Noorden, C. J. F., Steindorf, K., & Arndt, V. (2020). Cancer-related fatigue: Causes and current treatment options. *Current Treatment Options in Oncology*, 21(2), 17. <https://doi.org/10.1007/s11864-020-0707-5>
- Tuinman, M. A., Gazendam-Donofrio, S. M., & Hoekstra-Weebers, J. E. (2008). Screening and referral for psychosocial distress in oncologic practice: Use of the Distress Thermometer. *Cancer*, 113(4), 870–878. <https://doi.org/10.1002/cncr.23622>
- Walling, A. M., Weeks, J. C., Kahn, K. L., Tisnado, D., Keating, N. L., Dy, S. M., Arora, N. K., Mack, J. W., Pantoja, P. M., & Malin, J. L. (2015). Symptom prevalence in lung and colorectal cancer patients. *Journal of Pain and Symptom Management*, 49(2), 192–202. <https://doi.org/10.1016/j.jpainsymman.2014.06.003>
- Ward, W. L., Hahn, E. A., Mo, F., Hernandez, L., Tulskey, D. S., & Cella, D. (1999). Reliability and validity of the Functional Assessment of Cancer Therapy-Colorectal (FACT-C) quality of life instrument. *Quality of Life Research*, 8(3), 181–195. Retrieved from <https://www.ncbi.nlm.nih.gov/pubmed/10472150>
- Wendel-Vos, G. C., Schuit, A. J., Saris, W. H., & Kromhout, D. (2003). Reproducibility and relative validity of the short questionnaire to assess health-enhancing physical activity. *Journal of Clinical Epidemiology*, 56(12), 1163–1169. Retrieved from <https://www.ncbi.nlm.nih.gov/pubmed/14680666>
- Whistance, R. N., Conroy, T., Chie, W., Costantini, A., Sezer, O., Koller, M., Johnson, C. D., Pilkington, S. A., Arraras, J., Ben-Josef, E., Pullyblank, A. M., Fayers, P., Blazey, J. M., & Treatment of Cancer Quality of Life, G. (2009). Clinical and psychometric validation of the EORTC QLQ-CR29 questionnaire module to assess health-related quality of life in patients with colorectal cancer. *European Journal of Cancer*, 45(17), 3017–3026. <https://doi.org/10.1016/j.ejca.2009.08.014>
- Wieldraaijer, T., Duineveld, L. A., van Asselt, K. M., van Geloven, A. A., Bemelman, W. A., van Weert, H. C., Wind, J., & ICARE study group. (2017). Follow-up of colon cancer patients; causes of distress and need for supportive care: Results from the ICARE Cohort Study.

European Journal of Surgical Oncology, 43(1), 118–125. <https://doi.org/10.1016/j.ejso.2016.08.011>

Wilson, T. R., Alexander, D. J., & Kind, P. (2006). Measurement of health-related quality of life in the early follow-up of colon and rectal cancer. *Diseases of the Colon and Rectum*, 49(11), 1692–1702. <https://doi.org/10.1007/s10350-006-0709-9>

How to cite this article: Duineveld, L. A. M., Wieldraaijer, T., Govaert, M. J. P. M., Busschers, W. B., Wind, J., van Asselt, K. M., & van Weert, H. C. P. M. (2022). Symptoms and seeking supportive care and associations with quality of life after treatment for colon cancer: Results from the I CARE cohort study. *European Journal of Cancer Care*, 31(5), e13601. <https://doi.org/10.1111/ecc.13601>

APPENDIX A

SYMPTOM SCALES AND FUNCTIONING SCALES

Scale		Questions
Physical functioning	1	Do you have any trouble doing strenuous activities, like carrying a heavy shopping bag or a suitcase?
	2	Do you have any trouble taking a long walk?
	3	Do you have any trouble taking a short walk outside of the house?
	4	Do you need to stay in bed or a chair during the day?
	5	Do you need help with eating, dressing, washing yourself or using the toilet?
	6	Do you have any trouble doing light household work, like cooking, washing dishes, and ironing?
	7	Do you have any trouble doing light activities, like carrying light objects, sitting/standing with some walking, e.g. a desk job?
	8	Do you have any mobility troubles?
Role functioning	9	Were you limited in doing either your work or other daily activities?
	10	Were you limited in pursuing your hobbies or other leisure time activities?
Emotional functioning	11	Did you feel tense?
	12	Did you worry?
	13	Did you feel irritable?
	14	Did you feel depressed?
Cognitive functioning	15	Have you had difficulty in concentrating on things, like reading a newspaper or watching television?
	16	Have you had difficulty remembering things?
Unspecified psychological functioning	17	Have you had trouble sleeping?
	18	Were you worried about your health in the future?
	19	Have you worried about your weight?
	20	Did you feel guilty?
	21	Did you feel sad about being ill?
	22	Did you feel insecure?
	23	Did you worry about your future health?
	24	Did you worry about people's concern?
Social functioning	25	Has your physical condition or medical treatment interfered with your family life?
	26	Has your physical condition or medical treatment interfered with your social activities?
	27	Has your physical condition or medical treatment caused you financial difficulties?
Body image	28	Have you felt physically less attractive as a result of your disease or treatment?
	29	Have you been feeling less feminine/masculine as a result of your disease or treatment?
	30	Have you been dissatisfied with your body?
Pain	31	Have you had pain?
	32	Did pain interfere with your daily activities?

Scale		Questions
Fatigue	33	Did you need to rest?
	34	Have you felt weak?
	35	Were you tired?
Upper gastrointestinal tract	36	Have you felt nauseated?
	37	Have you vomited?
Lower gastrointestinal tract	38	Have you been constipated?
	39	Have you had diarrhoea?
	40	Have you had blood in your stools?
	41	Have you had mucus in your stools?
Unspecified gastrointestinal tract	42	Did you have abdominal pain?
	43	Did you have pain in your buttocks/anal area/rectum?
	44	Did you have a bloated feeling in your abdomen?
	45	Did you have a dry mouth?
Stoma-related	46	Have you had unintentional release of gas/flatulence from your stoma bag?
	47	Have you had leakage of stools from your stoma bag?
	48	Have you had sore skin around your stoma?
	49	Did frequent bag changes occur during the day?
	50	Did frequent bag changes occur during the night?
	51	Did you feel embarrassed because of your stoma?
	52	Did you have problems caring for your stoma?
Bowel-related (no stoma)	46	Have you had unintentional release of gas/flatulence from your back passage?
	47	Have you had leakage of stools from your back passage?
	48	Have you had sore skin around your anal area?
	49	Did frequent bowel movements occur during the day?
	50	Did frequent bowel movements occur during the night?
Urinary tract	51	Did you feel embarrassed because of your bowel movement?
	53	Did you urinate frequently during the day?
	54	Did you urinate frequently during the night?
	55	Have you had any unintentional release (leakage) of urine?
Chemotherapy-related	56	Did you have pain when you urinated?
	57	Have you lost hair as a result of your treatment?
	58	Have you had problems with your sense of taste?
Sexual-related (men)	59	Have you had tingling in hand/feet?
	60	To what extent were you interested in sex?
Sexual-related (women)	61	Did you have difficulty getting or maintaining an erection?
	62	To what extent were you interested in sex?
Single item	63	Did you have pain or discomfort during intercourse?
	64	Have you lacked appetite?
Single item	65	Were you short of breath?
Single item	66	Have you had fevers?
Single item	67	Have you felt unwell?

Note: Symptom, functioning scales and single items according to the EORTC QLQ-C30 and QLQ-CR29 scoring manuals (Aaronson et al., 1993; Whistance et al., 2009), which has been complemented with items of other validated questionnaires (Eypasch et al., 1995; Tuinman et al., 2008; Ward et al., 1999; Wendel-Vos et al., 2003).

APPENDIX B

SYMPTOM AND FUNCTIONAL SCALES AND THEIR ASSOCIATION WITH QoL AT INCLUSION

Scale	Participants that reported at least one item of the scale (N)		Quality of life summary score at inclusion [SD]
Physical functioning	Yes	138	78.00 [12.63]
	No	59	90.95 [8.44]
Role functioning	Yes	90	74.20 [11.71]
	No	107	88.33 [10.16]
Emotional functioning	Yes	147	79.41 [12.56]
	No	50	89.14 [11.38]
Cognitive functioning	Yes	116	76.98 [13.08]
	No	81	88.88 [9.01]
Unspecified psychologic functioning	Yes	187	81.07 [12.78]
	No	10	96.99 [3.77]
Social functioning	Yes	120	76.00 [12.38]
	No	77	91.03 [7.33]
Body image	Yes	88	77.25 [13.23]
	No	109	85.61 [11.50]
Pain	Yes	102	76.59 [13.23]
	No	95	87.55 [9.96]
Fatigue	Yes	158	78.60 [12.29]
	No	39	95.15 [4.09]
Upper gastrointestinal tract	Yes	55	71.62 [12.34]
	No	142	85.85 [10.87]
Lower gastrointestinal tract	Yes	124	77.90 [13.20]
	No	73	88.64 [9.28]
Unspecified gastrointestinal tract	Yes	157	79.86 [12.92]
	No	40	89.80 [9.75]
(non-)Stoma-related bowel symptoms	Yes	150	80.41 [12.95]
	No	45	87.65 [10.94]
Urinary tract	Yes	160	80.86 [12.60]
	No	37	86.29 [13.74]
Chemotherapy-related	Yes	115	77.68 [13.19]
	No	81	88.05 [9.79]
Sexual-related (men)	Yes	87	83.96 [12.51]
	No	17	85.67 [10.15]
Sexual-related (women)	Yes	51	82.25 [10.80]
	No	41	75.12 [15.26]
Single items			
Have you lacked appetite?	Yes	55	69.18 [12.01]
	No	142	86.79 [9.54]
Were you short of breath?	Yes	66	73.91 [12.48]
	No	131	85.89 [11.26]
Have you had fevers?	Yes	19	72.56 [14.25]
	No	177	82.83 [12.47]
Have you felt unwell?	Yes	101	74.54 [12.43]
	No	96	89.60 [8.15]

Abbreviation: SD, standard deviation.