



Published in final edited form as:

Support Care Cancer. 2013 April ; 21(4): 1193–1199. doi:10.1007/s00520-012-1648-8.

Assessment of Patient-Reported Measures of Bowel Function Before and After Pelvic Radiotherapy: An Ancillary Study of the North Central Cancer Treatment Group Study N00CA

Ms. Pamela J. Atherton, MS, Dr. Michele Y. Halyard, MD, Ms. Jeff A. Sloan, PhD, Dr. Robert C. Miller, MD, Dr. Richard L. Deming, MD, Dr. T. H. Patricia Tai, MD, Ms. Kathy J. Stien, RN, and Dr. James A. Martenson Jr, MD

Division of Biomedical Statistics and Informatics (Ms Atherton and Dr Sloan), Department of Radiation Oncology (Drs Miller and Martenson), and Department of Neurologic Surgery (Ms Stien), Mayo Clinic, Rochester, Minnesota; Department of Radiation Oncology (Dr Halyard), Mayo Clinic, Scottsdale, Arizona; Department of Radiation Oncology (Dr Deming), Iowa Oncology Research Association CCOP, Des Moines, Iowa; and Allan Blair Cancer Centre (Dr Tai), Regina, Saskatchewan, Canada

Abstract

Purpose—The Bowel Function Questionnaire (BFQ) has been used in clinical trials to assess symptoms during and after pelvic radiotherapy (RT). This study evaluated the importance of symptoms in the BFQ from a patient perspective.

Methods—Patients reported presence or absence of symptoms and rated importance of symptoms at baseline, 4 weeks after completion of pelvic RT, and 12 and 24 months after RT. The BFQ measured overall quality of life (QOL) and symptoms of nocturnal bowel movements, incontinence, clustering, need for protective clothing, inability to differentiate stool from gas, liquid bowel movements, urgency, cramping, and bleeding. Bowel movement frequency also was recorded. A content validity questionnaire was used to rate symptoms as “not very important,” “moderately unimportant,” “neutral,” “moderately important,” or “very important.”

Results—Most of the 125 participating patients rated all symptoms as moderately or very important. Generally, patients gave similar ratings for symptom importance at all study points, and ratings were independent of whether the patient experienced the symptom. Measures of greatest importance (moderately or very important) at baseline were ability to control bowel movements (94%), not having to wear protective clothing (90%), and not having rectal bleeding (94%). With the exception of need for protective clothing, the presence of a symptom at 4 weeks was associated with significantly worse QOL ($P < .01$ for all).

Conclusions—The BFQ has excellent content validity. Patients rated most symptoms as moderately or very important, indicating the BFQ is an appropriate tool for symptom assessment during and after pelvic RT.

Reprints: James A. Martenson Jr, MD, Department of Radiation Oncology, Mayo Clinic, 200 First St SW, Rochester, MN 55905 (jmartenson@mayo.edu).

Conflict of interest

None.

Keywords

bowel function; content validity; pelvic radiotherapy; quality of life

Introduction

Pelvic radiotherapy is commonly used for patients with gastrointestinal, gynecologic, genitourinary, or other pelvic cancers. Rectal dysfunction is the major form of symptomatic toxicity in these patients [1–6]. Randomized trials have been conducted previously by the North Central Cancer Treatment Group (NCCTG) to examine the mitigative effects of several pharmacologic agents on rectal toxicity during radiotherapy [1–4].

A bowel function questionnaire (BFQ) was used in several of these studies to assess the impact of the pharmacologic agents on bowel function [1, 3, 4]. The BFQ, developed and created by Mayo Clinic physicians, is based on a method used to assess bowel function of patients with resected rectal cancer [7]. The BFQ identifies patient-reported problems with various aspects of bowel function (yes or no response) to help evaluate how bowel dysfunction affects normal activities and quality of life (QOL). The primary purpose of the questionnaire is to identify patient-perceived problems with bowel function; this is considered more relevant and precise than collecting incidence measures that were assessed by clinicians. If the patient perceives that bowel function is a problem, then it is a problem [8]. Face validity of this instrument is derived from a content analysis of the literature and the framework used in the application of the original questionnaire [8–20].

N00CA was a randomized clinical trial comparing the effectiveness of depot octreotide versus placebo for prevention of diarrhea during pelvic radiotherapy. Details regarding patient eligibility, conduct of the study, and the lack of benefit of octreotide in the reduction of acute treatment-related diarrhea have been reported previously [4]. As part of that study, the importance of the various symptoms assessed by the BFQ was evaluated by patients. Here, we report the results of this secondary analysis and the long-term results of bowel function in the 2 treatment groups.

Methods and Materials

Written informed consent and institutional review board approval was required prior to entry of any patients onto NCCTG protocol N00CA [4]. During the course of the study, the BFQ and a content validity questionnaire (CVQ) were administered at baseline, 4 weeks after completion of radiotherapy, and at 12 and 24 months after radiotherapy. Assessed symptoms included nocturnal bowel movements, incontinence, clustering, protective clothing, stool-gas confusion, liquid bowel movements, urgency, cramping, and rectal bleeding. Brief descriptions of each symptom are shown in Table 1. The BFQ score, calculated with every assessment, represented the total number of symptoms experienced by the patient (eg, a patient reporting incontinence, clustering, and protective clothing would have a score of 3). The frequency of bowel movements also was recorded.

A QOL measure (the Uniscale questionnaire) was included in the BFQ [21]. With this tool, patients rated their overall QOL on a 0-to-10 scale, in which 0 indicated a QOL “as bad as it can be” and 10 indicated a QOL “as good as it can be”. The overall QOL score was not converted to a 0-to-100 scale (as is standard practice) because there were no between-assessment comparisons. Patients were categorized by QOL status (ie, score of ≤ 5 [considered clinically deficient QOL] vs >5) [22, 23].

Patients also completed a CVQ with each BFQ assessment. For the CVQ, patients rated each BFQ symptom on a 5-point scale corresponding to “not very important,” “moderately unimportant,” “neutral,” “moderately important,” or “very important” (with 5 being “very important”). Ratings were averaged to determine an overall importance score.

Basic summary statistics and frequencies of study end points were compiled for each time point. Fisher exact, χ^2 , and Wilcoxon statistical tests were used to compare results. Correlation analysis was completed to compare the average importance rating to patient QOL. *P* values less than .05 were considered statistically significant.

Results

This study was open for accrual between May 10, 2002 and October 28, 2005. It accrued 125 patients and all patients were eligible for these analyses. Patient characteristics have been reported previously [4]. Briefly, patients had a mean age of 62.6 years, most were men (58.4 %), and patients had cancer of the rectum (36 %), prostate (30.4 %), gynecologic organs (28.8%), or other organs (4.8%). No cytotoxic chemotherapy was allowed during radiotherapy except for 5-fluorouracil or cisplatin. 5-Fluorouracil was administered to 39.2 % of patients (4.8 % by bolus and 34.4 % by continuous infusion). Sixteen percent of patients received cisplatin. The numbers of patients who completed the BFQ were as follows: baseline, n=124; 4 weeks, n=114; 12 months, n=94; and 24 months, n=74. The numbers of patients who completed the CVQ (rating the importance of various measures of bowel function) were as follows: baseline, n=124; 4 weeks, n=106; 12 months, n=94; and 24 months, n=73.

Primary results of the octreotide trial showed that the study agent did not prevent acute diarrhea [4]. Baseline BFQ scores for both treatment arms were 1.3 ($P=.63$). Long-term (12-month) results showed that octreotide-treated patients had significantly higher overall BFQ scores (2.9 vs 1.9; $P=.04$). Octreotide-treated patients had more problems with clustering ($P=.05$) and a significantly greater need for protective clothing ($P=.04$) (Table 2). By 24 months, there were no significant differences in BFQ scores between treatment arms (2.2 [octreotide] vs 1.9 [placebo]; $P=.58$).

We next examined the relationship between mean overall QOL score and presence or absence of BFQ symptoms (Table 3). At week 4, QOL was significantly lower for patients for each symptoms except need for protective clothing ($P<.01$). At subsequent time points, the number of symptoms significantly associated with lower overall QOL progressively decreased (six symptoms at 12 months; two symptoms at 24 months). Greater than two bowel movements per day was associated with significantly decreased overall QOL at 4

weeks ($P=.046$) and 24 months ($P=.02$) but not at 12 months ($P=.17$). Further, when comparing patients with a QOL score of greater than 5 with patients with clinically deficient QOL (score ≤ 5), the latter group had a significantly higher number of symptoms at baseline (mean BFQ score, 2.3 vs 1.1; $P=.02$) and at 4 weeks (mean BFQ score, 5.1 vs 2.7; $P<.01$). Clinical deficiency in overall QOL was not significantly associated with the number of symptoms experienced at 12 or 24 months (data not shown).

Using data from the CVQ for all time points, the average importance patients placed on any bowel function symptom was 4.1, which corresponded to “moderately important” on the content validity descriptive scale. Detailed results of the content validity analysis are shown in Table 4. At baseline, all measures of bowel function were rated as moderately important or very important by the majority of patients (range, 54%–94%). The most important measures at baseline were ability to control bowel movements, not having to wear protective clothing, and not having rectal bleeding; these measures were rated as moderately important or very important by 94%, 90%, and 93% of patients, respectively. In general, the percentage of patients that ranked a symptom as moderately important or very important was similar for all time points. For example, the proportion of patients that rated ability to control bowel movements as moderately important or very important was 94%, 94%, 86%, and 96% at baseline, 4 weeks, 12 months, and 24 months, respectively.

CVQ ratings were independent of whether the patient experienced the symptom. Table 5 details how patients with or without a specific symptom rated the importance of that symptom. For example, 100% of the patients who experienced incontinence at 4 weeks rated this symptom as moderately or very important, and 84% of patients who did not have incontinence also rated it as moderately or very important.

An exploratory analysis was conducted to determine whether the BFQ score was associated with overall QOL. This analysis used all QOL and BFQ scores from all time points in the study. Pearson correlation analysis showed a moderate correlation ($r=-0.41$; $P<.001$) between the overall QOL and total BFQ scores.

Discussion

The results of the N00CA bowel function assessment are similar to those reported elsewhere from randomized studies [24–29] and nonrandomized studies [7, 16, 30]. All have shown significantly worse outcomes for bowel function after pelvic radiotherapy.

The present study sought to determine the importance of commonly used measures of bowel function from a patient perspective, which then allowed us to determine content validity of the BFQ. All symptoms measured by the BFQ were rated by patients as being either moderately important or very important. At 4 weeks, all symptoms except for need for protective clothing were significantly associated with worse QOL. Progressively fewer symptoms were associated with worse QOL at 12 and 24 months, suggesting that patients may have the ability to adapt to bowel function problems caused by pelvic radiotherapy (PR). The analyses comparing patients with and without clinically deficient QOL also

supports this interpretation of the data; in our cohort, a worse QOL score did not necessarily indicate increased incidence of symptoms.

The findings of this study have important implications for informed consent before PR and for counseling after treatment. In the informed consent process, particular emphasis should be placed on symptoms that patients regard as most important (eg, incontinence). An awareness of symptoms that are most important to patients can also facilitate counseling after radiotherapy. For example, bleeding is often encountered during and after a course of PR [1, 3, 4, 16, 28, 29], and the present study shows that most patients consider this an important symptom that may also be associated with diminished QOL. If serious other causes of rectal bleeding have been excluded, clinicians will be in a better position to provide reassurance to patients with regard to the clinical significance of this symptom.

The findings of this study also have important research implications. Symptoms in the BFQ are important to patients and are therefore appropriate targets for studies aimed at mitigating toxicity caused by PR. In particular, efforts to reduce incontinence, rectal bleeding, and the need for protective clothing should be emphasized in future clinical trials. The total BFQ score is significantly correlated with QOL, indicating that it is a valid measure of global bowel function. Furthermore, the content of the BFQ has been validated by the patients in this study. Thus, the BFQ can be used as a support measure to aid symptom awareness.

Conclusion

The BFQ has excellent content validity. Patients rated most BFQ symptoms as moderately important or very important, indicating that it is an appropriate tool for symptom assessment during and after PR. Our results also suggest that symptomatic problems after radiotherapy may adversely affect QOL. These criteria make them appropriate targets for future research to mitigate radiation-related bowel dysfunction.

Acknowledgments

This study was conducted as a collaborative trial of the North Central Cancer Treatment Group and Mayo Clinic and was supported, in part, by Public Health Service grants CA-25224, CA-60276, CA-35101, CA-35103, CA-35415, CA-35431, CA-63849, CA-35269, CA-35119, CA-37417, CA-35267, CA-52654, and CA-35195.

Additional institutions that enrolled patients in this study included: Duluth CCOP, Duluth, MN, USA (Daniel A. Nikceovich, MD); Mayo Clinic, Jacksonville, FL, USA (Kurt A. Jaeckle, MD); Sioux Community Cancer Consortium, Sioux Falls, SD, USA (Miroslaw Mazurczak, MD); Spartanburg Regional Medical Center, Spartanburg, SC, USA (James D. Bearden, III, MD); Meritcare Hospital CCOP, Fargo, ND, USA (Preston D. Steen, MD); Metro-Minnesota Community Clinical Oncology Program, St. Louis Park, MN, USA (Patrick J. Flynn, MD); Carle Cancer Center CCOP, Urbana, IL, USA (Kendrieth M. Rowland, Jr, MD); Montana Cancer Consortium, Billings, MT, USA (Benjamin T. Marchello, MD); and Wichita Community Clinical Oncology Program, Wichita, KS, USA (Shaker R. Dakhil, MD).

Abbreviations

BFQ	Bowel function questionnaire
CVQ	Content validity questionnaire
NCCTG	North Central Cancer Treatment Group

PR	Pelvic Radiotherapy
QOL	Quality of life

References

1. Kozelsky TF, Meyers GE, Sloan JA, Shanahan TG, Dick SJ, Moore RL, et al. North Central Cancer Treatment Group. Phase III double-blind study of glutamine versus placebo for the prevention of acute diarrhea in patients receiving pelvic radiation therapy. *J Clin Oncol*. 2003; 21(9):1669–1674. [PubMed: 12721240]
2. Martenson JA Jr, Hyland G, Moertel CG, Mailliard JA, O’Fallon JR, Collins RT, et al. Olsalazine is contraindicated during pelvic radiation therapy: results of a double-blind, randomized clinical trial. *Int J Radiat Oncol Biol Phys*. 1996; 35(2):299–303. [PubMed: 8635937]
3. Martenson JA, Bollinger JW, Sloan JA, Novotny PJ, Urias RE, Michalak JC, et al. Sucralfate in the prevention of treatment induced diarrhea in patients receiving pelvic radiation therapy: a North Central Cancer Treatment Group phase III double-blind placebo-controlled trial. *J Clin Oncol*. 2000; 18(6):1239–1245. [PubMed: 10715293]
4. Martenson JA, Halyard MY, Sloan JA, Proulx GM, Miller RC, Deming RL, et al. Phase III, double-blind study of depot octreotide versus placebo in the prevention of acute diarrhea in patients receiving pelvic radiation therapy: results of North Central Cancer Treatment Group N00CA. *J Clin Oncol*. 2008; 26(32):5248–5253. Epub 2008 Sep 2. [PubMed: 18768432]
5. Miller RC, Martenson JA, Sargent DJ, Kahn MJ, Krook JE. Acute treatment-related diarrhea during postoperative adjuvant therapy for high-risk rectal carcinoma. *Int J Radiat Oncol Biol Phys*. 1998; 41(3):593–598. [PubMed: 9635707]
6. Miller RC, Sargent DJ, Martenson JA, Macdonald JS, Haller D, Mayer RJ, et al. Acute diarrhea during adjuvant therapy for rectal cancer: a detailed analysis from a randomized intergroup trial. *Int J Radiat Oncol Biol Phys*. 2002; 54(2):409–413. [PubMed: 12243815]
7. Kollmorgen CF, Meagher AP, Wolff BG, Pemberton JH, Martenson JA, Ilstrup DM. The long-term effect of adjuvant postoperative chemoradiotherapy for rectal carcinoma on bowel function. *Ann Surg*. 1994; 220(5):676–682. [PubMed: 7979617]
8. Glickman S, Kamm MA. Bowel dysfunction in spinal-cord injury patients. *Lancet*. 1996; 347(9016):1651–1653. [PubMed: 8642958]
9. Chia YW, Lee TK, Kour NW, Tung KH, Tan ES. Microchip implants on the anterior sacral roots in patients with spinal trauma: does it improve bowel function? *Dis Colon Rectum*. 1996; 39(6):690–694. [PubMed: 8646959]
10. Crook J, Esche B, Futter N. Effect of pelvic radiotherapy for prostate cancer on bowel, bladder, and sexual function: the patient’s perspective. *Urology*. 1996; 47(3):387–394. [PubMed: 8633407]
11. Crowell MD, Dubin NH, Robinson JC, Cheskin LJ, Schuster MM, Heller BR, et al. Functional bowel disorders in women with dysmenorrhea. *Am J Gastroenterol*. 1994; 89(11):1973–1977. [PubMed: 7942720]
12. Garcia Compean D, Ramos Jimenez J, Guzman de la Garza F, Saenz C, Maldonado H, Barragan RF, et al. Octreotide therapy of large-volume refractory AIDS-associated diarrhea: a randomized controlled trial. *AIDS*. 1994; 8(11):1563–1567. [PubMed: 7848592]
13. Gebbia V, Carreca I, Testa A, Valenza R, Curto G, Cannata G, et al. Subcutaneous octreotide versus oral loperamide in the treatment of diarrhea following chemotherapy. *Anticancer Drugs*. 1993; 4(4):443–445. [PubMed: 8400346]
14. McMillan SC, Williams FA. Validity and reliability of the Constipation Assessment Scale. *Cancer Nurs*. 1989; 12(3):183–188. [PubMed: 2743302]
15. Graf W, Ekstrom K, Glimelius B, Pahlman L. A pilot study of factors influencing bowel function after colorectal anastomosis. *Dis Colon Rectum*. 1996; 39(7):744–749. [PubMed: 8674365]
16. Haddock MG, Sloan JA, Bollinger JW, Soori G, Steen PD, Martenson JA. North Central Cancer Treatment Group. Patient assessment of bowel function during and after pelvic radiotherapy:

- results of a prospective phase III North Central Cancer Treatment Group clinical trial. *J Clin Oncol.* 2007; 25(10):1255–1259. [PubMed: 17401014]
17. Ho YH, Low D, Goh HS. Bowel function survey after segmental colorectal resections. *Dis Colon Rectum.* 1996; 39(3):307–310. [PubMed: 8603553]
 18. Kannisto M, Rintala R. Bowel function in adults who have sustained spinal cord injury in childhood. *Paraplegia.* 1995; 33(12):701–703. [PubMed: 8927408]
 19. Kapadia SA, Raimundo AH, Grimble GK, Aimer P, Silk DB. Influence of three different fiber-supplemented enteral diets on bowel function and short-chain fatty acid production. *JPEN J Parenter Enteral Nutr.* 1995; 19(1):63–68. [PubMed: 7658603]
 20. Rintala RJ, Lindahl H. Is normal bowel function possible after repair of intermediate and high anorectal malformations? *J Pediatr Surg.* 1995; 30(3):491–494. [PubMed: 7760250]
 21. Sloan JA, Loprinzi CL, Kuross SA, Miser AW, O’Fallon JR, Mahoney MR, et al. Randomized comparison of four tools measuring overall quality of life in patients with advanced cancer. *J Clin Oncol.* 1998; 16(11):3662–3673. [PubMed: 9817289]
 22. Sloan JA, Dueck AC, Erickson PA, Guess H, Revicki DA, Santanello NC. Mayo/FDAPatient-Reported Outcomes Consensus Meeting Group. Analysis and interpretation of results based on patient reported outcomes. *Value Health.* 2007; 10(Suppl 2):S106–S115. [PubMed: 17995469]
 23. Sloan JA, Berk L, Roscoe J, Fisch MJ, Shaw EG, Wyatt G, et al. National Cancer Institute. Integrating patient-reported outcomes into cancer symptom management clinical trials supported by the National Cancer Institute-sponsored clinical trials networks. *J Clin Oncol.* 2007; 25(32): 5070–5077. [PubMed: 17991923]
 24. Dahlberg M, Glimelius B, Graf W, Pahlman L. Preoperative irradiation affects functional results after surgery for rectal cancer: results from a randomized study. *Dis Colon Rectum.* 1998; 41(5): 543–549. [PubMed: 9593234]
 25. Lange MM, den Dulk M, Bossema ER, Maas CP, Peeters KC, Rutten HJ, et al. Cooperative clinical investigators of the Dutch Total Mesorectal Excision Trial. Risk factors for faecal incontinence after rectal cancer treatment. *Br J Surg.* 2007; 94(10):1278–1284. [PubMed: 17579345]
 26. Lundby L, Krogh K, Jensen VJ, Gandrup P, Qvist N, Overgaard J, et al. Long-term anorectal dysfunction after postoperative radiotherapy for rectal cancer. *Dis Colon Rectum.* 2005; 48(7): 1343–1349. [PubMed: 15933797]
 27. Nout RA, van de Poll-Franse LV, Lybeert ML, Warlam-Rodenhuis CC, Jobsen JJ, Mens JW, et al. Long-term outcome and quality of life of patients with endometrial carcinoma treated with or without pelvic radiotherapy in the post operative radiation therapy in endometrial carcinoma 1 (PORTEC-1) trial. *J Clin Oncol.* 2011; 29(13):1692–1700. Epub 2011 Mar 28. [PubMed: 21444867]
 28. Peeters KC, van de Velde CJ, Leer JW, Martijn H, Junggeburst JM, Kranenbarg EK, et al. Late side effects of short-course preoperative radiotherapy combined with total mesorectal excision for rectal cancer: increased bowel dysfunction in irradiated patients: a Dutch colorectal cancer group study. *J Clin Oncol.* 2005; 23 (25):6199–6206. [PubMed: 16135487]
 29. Pinkawa M, Piroth MD, Holy R, Fishedick K, Klotz J, Szekely-Orban D, et al. Quality of life after whole pelvic versus prostate-only external beam radiotherapy for prostate cancer: a matched-pair comparison. *Int J Radiat Oncol Biol Phys.* 2011; 81 (1):23–28. Epub 2010 Sep 9. [PubMed: 20832182]
 30. Bruheim K, Guren MG, Skovlund E, Hjermsstad MJ, Dahl O, Frykholm G, et al. Late side effects and quality of life after radiotherapy for rectal cancer. *Int J Radiat Oncol Biol Phys.* 2010; 76 (4): 1005–1011. Epub 2009 Jun 18. [PubMed: 19540058]

Table 1

Definition of Terms in the BFQ

BFQ Symptom	Definition
Nocturnal bowel movements	Needing to get up at night for bowel movements
Incontinence	Loss of control of bowel movements
Clustering	Needing to have a bowel movement within 30 minutes of a prior bowel movement
Protective clothing	Need for protective clothing or a pad
Stool-gas confusion	Unable to differentiate between stool and gas
Liquid bowel movements	Having liquid bowel movements
Urgency	Inability to delay bowel movements at least 15 minutes
Cramping	Cramping with bowel movements
Rectal bleeding	Blood with bowel movements

BFQ, bowel frequency questionnaire.

Table 2

Bowel Function at 12 and 24 Months After Radiotherapy

BFQ Symptom ^a	Affected Patients, %					
	12 Months			24 Months		
	Octreotide (n=44)	Placebo (n=50)	P Value	Octreotide (n=36)	Placebo (n=38)	P Value
Nocturnal bowel movements	20.5	22.0	.86	11.1	23.7	.16
Incontinence	15.9	8.2	.25	16.7	13.2	.67
Clustering	56.8	36.7	.05	41.7	39.5	.85
Protective clothing	23.3	8.2	.04	16.7	7.9	.25
Stool-gas confusion	32.6	24.5	.39	19.4	31.6	.23
Liquid bowel movements	27.3	14.6	.13	16.7	18.4	.84
Urgency	62.8	48.9	.19	58.3	43.2	.20
Cramping	34.1	18.4	.08	22.2	7.9	.08
Rectal bleeding	16.3	10.4	.41	17.1	5.4	.11

BFQ, bowel frequency questionnaire.

^aComplete description of symptoms is shown in Table 1.

Table 3

Effect of BFQ Symptom on QOL Scores

BFQ Symptom ^a	QOL Score, mean ^b								
	4 Weeks		12 Months		24 Months		BFQ Symptom		
	Present	Absent	P Value	Present	Absent	P Value	Present	Absent	
Nocturnal bowel movements	5.9	8.1	<.01	7.2	8.5	.01	7.9	8.7	.05
Incontinence	6.3	7.6	<.01	7.4	8.3	.03	8.6	8.5	.98
Clustering	6.8	8.0	<.01	7.8	8.6	.01	8.1	8.8	<.01
Protective clothing	7.4	7.1	.63	7.0	8.4	.01	8.4	8.5	.73
Stool-gas confusion	6.0	8.1	<.01	7.5	8.5	<.01	8.1	8.7	.13
Liquid bowel movements	6.4	7.8	<.01	7.3	8.5	<.01	8.2	8.6	.35
Urgency	6.8	8.1	<.01	8.1	8.5	.53	8.2	8.9	.02
Cramping	6.5	8.0	<.01	7.8	8.4	.06	8.0	8.6	.15
Rectal bleeding	6.4	7.7	<.01	7.9	8.3	.45	8.0	8.6	.13

BFQ, bowel frequency questionnaire; QOL, quality of life.

^aComplete description of symptoms is shown in Table 1.

^bPossible scores ranged from 0–10 (higher values indicate better QOL).

Table 4

Patient-Assessed Measures of Bowel Function Before and After Pelvic Radiotherapy^a

Bowel Function Measure	Patients, %			
	Baseline (n=124)	4 Weeks (n=105)	12 Months (n=92)	24 Months (n=73)
Not having to get up at night to have a bowel movement				
Not very important or moderately unimportant	17	19	20	11
Neutral	23	15	11	25
Moderately important	30	26	33	33
Very important	30	40	35	31
Able to maintain control of bowel movement				
Not very important or moderately unimportant	1	3	5	1
Neutral	5	3	9	3
Moderately important	10	12	12	21
Very important	84	82	74	75
Not having a bowel movement within 30 minutes of a previous bowel movement				
Not very important or moderately unimportant	15	14	20	14
Neutral	31	27	25	30
Moderately important	27	31	30	34
Very important	27	27	25	22
Not having to wear protective clothing or a pad				
Not very important or moderately unimportant	4	5	5	8
Neutral	6	7	8	10
Moderately important	15	21	18	10
Very important	75	68	69	73
Able to tell the difference between stool and gas				
Not very important or moderately unimportant	4	5	4	3
Neutral	13	10	11	7
Moderately important	30	25	34	34
Very important	53	60	51	56
Neutral	31	27	25	30
Not having liquid bowel movements				

Bowel Function Measure	Patients, %				
	Baseline (n=124)	4 Weeks (n=105)	12 Months (n=92)	24 Months (n=73)	
Not very important or moderately unimportant	4	6	4	4	4
Neutral	16	12	12	12	18
Moderately important	31	29	37	37	34
Very important	48	53	47	47	44
Able to delay having a bowel movement for at least 15 minutes					
Not very important or moderately unimportant	6	6	7	7	7
Neutral	15	9	16	16	13
Moderately important	40	37	40	40	44
Very important	39	49	37	37	37
Not having cramping with bowel movements					
Not very important or moderately unimportant	5	5	14	14	8
Neutral	15	17	15	15	15
Moderately important	33	30	31	31	38
Very important	48	48	40	40	38
Not having blood in bowel movements					
Not very important or moderately unimportant	1	1	4	4	1
Neutral	6	4	6	6	5
Moderately important	10*	17	7	7	11
Very important	83*	78	82	82	82

^a All percentages were rounded to the nearest whole number. Some percentage totals are slightly more or less than 100% because of rounding.

* The sum of these two values in the abstract and text is reported as 94% due to rounding.

Table 5

Importance of Individual BFQ Symptoms for Patients With and Without the Symptom

BFQ Symptom ^a	Patients, % ^b					
	Symptom at 4 Weeks		Symptom at 12 Months		Symptom at 24 Months	
	Present	Absent	Present	Absent	Present	Absent
Nocturnal bowel movements	62	61	65	69	54	64
Incontinence	100	84	91	87	100	94
Clustering	57	51	53	56	50	59
Protective clothing	67	84	79	90	56	85
Stool-gas confusion	83	76	88	86	89	89
Liquid bowel movements	75	77	74	86	62	80
Urgency	79	77	84	70	76	81
Cramping	75	69	58	75	82	71
Rectal bleeding	81	90	92	90	100	92

^aComplete description of symptoms is shown in Table 1.^bPatients rated the symptom as “moderately important” or “very important.”