

# Comorbidities play a larger role in predicting health-related quality of life compared to having an ostomy

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## Abstract

**Background:** Previous research suggests an ostomy worsens health-related quality of life (HR-QOL), but comorbidities also can affect HR-QOL.

**Methods:** Eligible patients had abdominal operation with ostomy (cases) or similar procedure without ostomy (controls). Patients were recruited for this case-control study from 3 Veterans Affairs hospital medical and pharmacy records. Comorbidities were assessed with Charlson-Deyo Comorbidity Index. Multinomial logistic regression evaluated the impact of comorbidities and having an ostomy on HR-QOL, measured using the Medical Outcomes Study Short Form 36 for Veterans.

**Results:** A total of 237 ostomates (cases) and 268 controls were studied. Average age was 69 years; 64% of cases had colostomy, 36% ileostomy. Twenty-nine percent of patients had a high level of comorbidities. Cases and controls were similar except for reasons for undergoing surgery. High comorbidity was a significant predictor of low HR-QOL in 6 domains of the Short Form 36 for Veterans; having an ostomy was a significant predictor in 4.

**Conclusions:** High comorbidity significantly influences low HR-QOL and impacted more domains than having an ostomy. © 2007 Excerpta Medica Inc. All rights reserved.

**Keywords:** Comorbidities; Ostomy; Health-related quality of life

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Intestinal stoma, or ostomy, is a surgical procedure to provide fecal diversion of the small (ileostomy) or large intestine (colostomy) through the abdominal wall. Ostomies are often performed during bowel resections, and can be either temporary or permanent. The most common indications for ostomy include benign etiologies such as diverticulitis or inflammatory bowel disease (IBD) and malignant condi-

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tions such as rectal cancer. The prevalence of patients having an ostomy is estimated to be approximately 450,000 to 500,000 in the United States, with an annual incidence of more than 120,000 [1]. Irrespective of the indication for ostomy, it impacts patient health-related quality of life (HR-QOL). HR-QOL is a very complex, multidimensional concept affecting the physical, social, psychological, and spiritual domains. These domains are interrelated such that patients undergoing an ostomy have a change in their physical functioning which affects their social, psychological and spiritual functioning.

There is a growing field of research concerned with developing, evaluating, and applying HR-QOL measures in health-care settings. Recent studies have focused on the HR-QOL of ostomy patients, showing that ostomy significantly affects HR-QOL [2–5]. Nugent et al showed that 80% of patients experienced some change in lifestyle and more than 40 % had sexual impairment. Karadag et al and Silva et al showed a profoundly negative impact of ostomy on HR-QOL [3,4]. Studies also have shown that stoma patients have significantly higher prevalence of depression, loneliness, suicidal thoughts, feelings of stigma, and low self-esteem [6,7].

Veterans have been shown to have lower overall HR-QOL than non-Veterans [8], and the Medical Outcomes Study Short Form 36 for Veterans (SF-36V) has been developed to better describe the veteran population [9,10]. The SF-36 has been used to describe other HR-QOL difficulties with different diseases (eg, head and neck cancers [11]) and procedures (eg, total hip arthroplasty [12], hemodialysis [13]), but no studies have been performed comparing the impact of both comorbidities and having an ostomy on HR-QOL in Veterans Affairs (VA) patients. The overarching goal of the current study was to evaluate whether low quality of life observed in patients having an ostomy (cases) is due to the presence of the ostomy itself or because of comorbid disease burden. In addition, we evaluated the impact of comorbid disease burden on HR-QOL life in patients without an ostomy (controls). This multicenter study used the SF-36V to measure the HR-QOL.

## Methods

An in-depth description of the methods design of the VA Ostomy Health-Related Quality of Life Study has been published elsewhere [14]. Briefly, all subjects were veterans receiving care at VA Medical Centers in Tucson, Indianapolis, or Los Angeles. Subjects included 237 patients with known intestinal stomas (cases) and 268 patients who had similar procedures that did not lead to an ostomy (controls). Patients that underwent ostomy take-down were excluded. Patients were mailed the SF-36V, a measure of general HR-QOL adapted for use in veteran populations [8,9,15] from the widely used Medical Outcomes Study SF-36 [16].

The SF-36V retains the original SF-36 measurement model, which includes 8 multi-item scales (ie, Physical Function, Role Limitations due to Physical Problems, Bodily Pain, General Health Perceptions, Vitality, Social Functioning, Role Limitations due to Emotional Problems, and Mental Health) as well as physical and mental component summary scores. The subscales and component summary scores have a possible range of 0 to 100, with higher scores reflecting better functioning and/or well-being.

Medical history items obtained from VA administrative databases and electronic charts included type of operation, operative findings, type of stoma, reason for stoma, length of time since surgery, preoperative marking by a stoma nurse, and other comorbid medical problems. The Charlson–Deyo Comorbidity Index [17] was constructed from International Classification of Diseases-9 codes from the VA Patient Treatment File (admissions) and Outpatient Encounter (reasons for visits) databases during the year prior to the survey. For patients whose reason for an ostomy was cancer, the type of tumor was confirmed to the extent possible from the tumor registry.

Scales were scored and missing data were handled according to the instrument developers' scoring algorithms. The SF-36V scale scores were coded as missing if more than half of the responses for the scale's items were missing. Each participant signed an institutional review board–approved written informed consent.

## Statistical analysis

Student *t* test was used to compare the demographic and clinical characteristics between the cases and the controls. The mean scores from the SF-36V scales are reported for both the cases and controls. To test the robustness of our findings we divided scores of each of the 8 domains of the SF-36 into groups (<25, ≥25 to <50, ≥50 to <75, ≥75 to 100). We defined “highest HR-QOL” if the values were within the top 25th percentile (≥75 to 100) and used this as the reference group in all analyses. Comorbidity variable was constructed from the Charlson–Deyo Comorbidity Index and divided it into 2 groups: patients who had 0, 1, or 2 scores were defined as having low comorbidity, whereas patients who had score more than 2 on the Charlson–Deyo index comprised the high-comorbidity group. Two-sample test of proportions was used for each of the category of race, education, income, employment status, marital status, and reasons for surgery (colorectal cancer, benign tumor, IBD, acute inflammation/infection, and other). Multinomial logistic regression was used to estimate the associations of comorbidities and having an ostomy on HR-QOL as measured by the SF-36V, adjusting for sociodemographics (age, race, education, income, employment status, and marital status), and reasons for surgery. Analyses were performed using STATA version 9.0 (Statacorp, College Station, TX). *P* values less than .05 were considered statistically significant.

## Results

### Patient demographics

Descriptive analyses regarding ostomate (case) and control characteristics are presented in Table 1. A total of 481 patients were studied: 224 ostomates and 257 controls. Of the 224 cases, 143 patients had colostomy, whereas 81 patients had an ileostomy. Mean age was 69 years for ostomates and 68 years for controls. There were 481 males and 24 females; female subjects were excluded due to small sample size (13 cases, 11 controls). There were no significant differences between the 2 groups as regards race/ethnicity, education, annual household income, employment, current marital status, and Charlson–Deyo Comorbidity Index. Reasons for surgery were signifi-

Table 1  
Demographics/patient characteristics

Variable	Cases (n = 224)	Controls (n = 257)	P value
Age (mean ± SD)	69.1 ± 12.0	67.6 ± 11.5	.16
Race/ethnicity (%)			
Non-Hispanic Whites	83.5	78.2	.17
Hispanics	6.7	6.6	.97
Blacks	6.7	11.3	.08
Other/unknown	3.1	3.9	.64
Education (%)			
Not a high school graduate	16.1	15.0	.74
High school graduate	28.9	28.5	.92
Vocational school degree	3.2	3.2	1.00
Some college, no degree	28.4	32.8	.30
College graduate	14.7	9.5	.08
Some graduate school, no degree	2.7	4.7	.25
Graduate school degree	6.0	6.3	.89
Annual household income (%)			
\$15,000 or less	34.8	4.5	.20
\$15,001–\$30,000	38.6	34.0	.29
\$30,001–\$50,000	16.2	18.6	.49
\$50,001–\$75,000	8.6	5.3	.15
\$75,001–\$100,000	.9	1.2	.75
More than \$100,000	.9	.4	.49
Employment (%)			
Full-time	1.3	15.2	.11
Part-time	8.0	8.6	.81
Retired	65.6	63.8	.68
Unemployed/unknown	16.1	12.4	.25
Current marital status (%)			
Single	14.9	17.7	.40
Married	59.9	52.9	.12
Divorced	14.4	14.9	.87
Widowed	7.7	8.2	.84
Separated	1.3	2.0	.55
Partnered	1.8	4.3	.12
Reason for surgery (%)			
Colorectal cancer	51.8	45.1	.14
Benign tumor	2.7	15.2	<.0001*
Inflammatory bowel disease	24.1	4.3	<.0001*
Acute inflammation/infection	11.1	21.0	.003*
Other	1.3	14.4	.17
Charlson Comorbidity Index (%)			
>2	25.9	31.5	.18

\* Statistically significant ( $P < .05$ ).

cantly different between the 2 groups. The percentage of ostomates presenting with benign tumor and acute inflammation/infection was much lower (3% and 11%) compared to the controls (15% and 21%). In contrast, 24% of the ostomates presented with IBD compared to 4% of controls. There was no significant difference between the 2 groups for colorectal cancer. Overall 29% of patients had a high level of comorbidities (score >2). The 3 most common comorbidities in both the groups were dementia, uncomplicated diabetes mellitus, and tumor.

#### HR-QOL as measured by the SF-36V

The mean scores from the SF-36V scales for both groups ranged from 42 to 72. Ostomates had lower scores for all 8

of the domains as shown in Fig. 1. Statistically significant differences were seen between ostomates and controls in 5 domains: Physical Function, Role Limitations–Physical, Social Function, Role Limitations–Emotional, and Mental Health. Table 2 gives the percentage of case and control patients by groups for all 8 domains of SF-36V. In general, the low HR-QOL groups ( $\leq 25$ ;  $>25$  and  $\leq 50$ ) have higher percentages of ostomates than controls.

#### Multivariate results

Table 3 presents the results of the multivariate multinomial regression to predict the effect of comorbidity and having an ostomy on the outcome of SF-36V groups. The reference group was SF-36V domain scores in the fourth group ( $>75$  and  $\leq 100$ ; highest HR-QOL).

With respect to physical health domains, high comorbidity was a significant predictor of low HR-QOL for all 3 groups of Physical Function domain and the first group (lowest HR-QOL) in the Role Limitations–Physical domain. In contrast, having an ostomy was not a significant predictor of HR-QOL in either the Physical Function or the Role Limitations–Physical domains. Neither comorbidities nor having an ostomy were significant predictors for the Bodily Pain domain. For the General Health domain, both high comorbidity and having an ostomy significantly predicted low HR-QOL only for patients in the first group. However, the magnitude of the odds ratio was larger for comorbidity (2.4) than having an ostomy (2.2).

With respect to mental health domains, high comorbidity was a significant predictor of low HR-QOL for the first and second domains of Vitality. Having an ostomy was a much stronger predictor of low HR-QOL (2.8) for patients in the first group of Social Function domain, whereas for the second and third group, high comorbidity significantly predicted low HR-QOL (2.2–2.4). Patients with high comorbidity had 2.8 times the odds of low HR-QOL in the first group of the Emotional Role–Limitation domain, whereas having an ostomy significantly predicted low HR-QOL in its second group (odds ratio 2.0). For the Mental Health domain, having an ostomy was a significant predictor of low HR-QOL for the patients in the second and third groups (1.8–2.0).

In summary, high comorbidity was a significant predictor of low HR-QOL in 6 domains of the SF-36V: Physical Functioning, General Health, Vitality, Physical Role-Functioning, Emotional Role-Functioning, and Social Functioning. In contrast, presence of an ostomy was a significant predictor of low HR-QOL in only 4 domains of the SF-36V: General Health, Mental Health, Emotional Role-Functioning, and Social Functioning. When analyzing comorbidity and having an ostomy simultaneously, having an ostomy was a stronger predictor than comorbidity for 2 domains (Mental Health and Social Functioning), while comorbidity was a stronger predictor than having an ostomy for 5 domains (Physical Functioning, General Health, Vitality, Physical Role-Functioning, and Emotional Role-Functioning).

#### Comments

Evaluating the HR-QOL in ostomy patients is important, but all factors potentially impacting HR-QOL must be addressed, including comorbidities. Given that medical co-

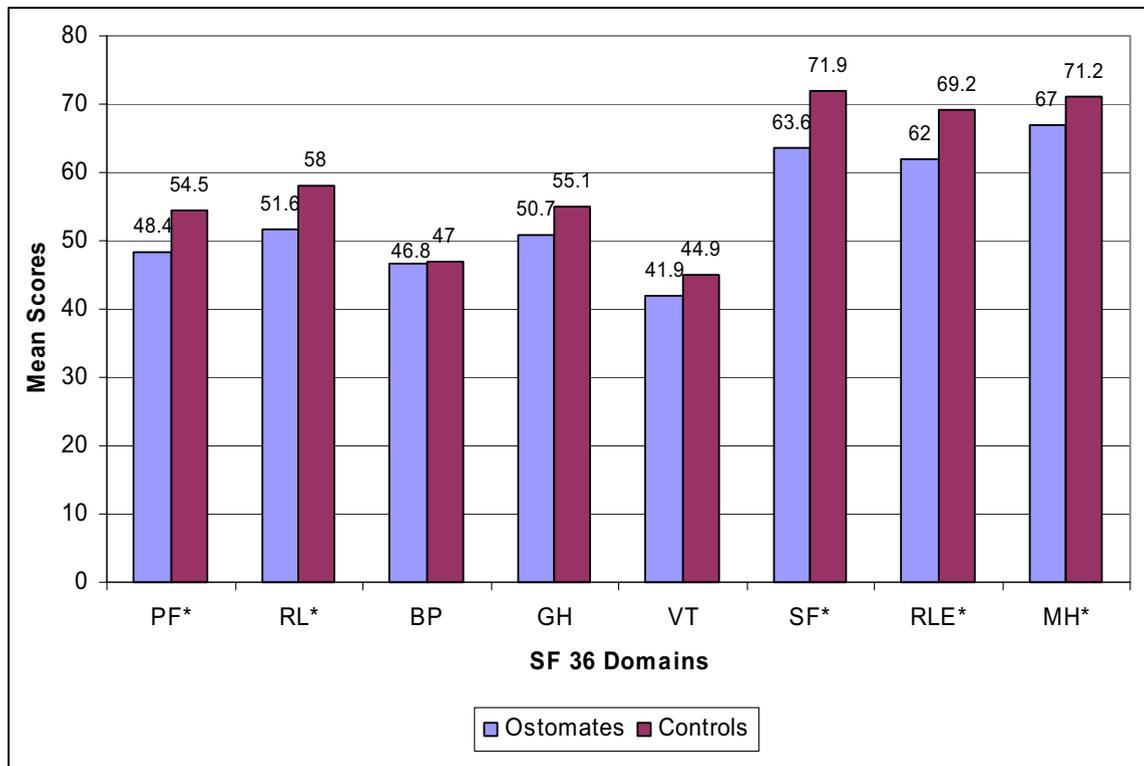


Fig. 1. Mean SF-36V scores for ostomates and controls. PF = Physical Function; RL = Role Limitations–Physical; BP = Bodily Pain; GH = General Health; VT = Vitality; SF = Social Function; RLE = Role Limitations–Emotional; MH = Mental Health. \*Statistically significant ( $P < .05$ ).

morbidities independently influence HR-QOL, it logically follows that their effects are not diminished in ostomy patients. In this case-control study we used the SF-36V to

Table 2  
Percentage of cases and controls in SF-36 domains

Variable	>75 & ≤100 (%)	>50 & ≤75 (%)	>25 & ≤50 (%)	≤25 (%)
<b>Physical function</b>				
Cases (n = 210)	25.2	22.4	26.2	26.2
Controls (n = 245)	32.2	22.5	23.3	22.0
<b>Role Limitations–Physical</b>				
Cases (n = 194)	27.3	22.2	30.9	19.6
Controls (n = 234)	32.9	27.4	25.6	14.1
<b>Bodily Pain</b>				
Cases (n = 210)	20.5	10.0	53.3	16.2
Controls (n = 243)	18.9	11.9	53.5	15.6
<b>General Health</b>				
Cases (n = 215)	20.5	28.8	30.7	20.0
Controls (n = 240)	26.7	32.9	26.7	13.8
<b>Vitality</b>				
Cases (n = 208)	12.0	23.6	33.2	31.3
Controls (n = 239)	11.3	29.7	36.8	22.2
<b>Social Function</b>				
Cases (n = 214)	38.3	19.2	23.8	18.7
Controls (n = 248)	48.0	22.2	19.4	10.5
<b>Role Limitations–Emotional</b>				
Cases (n = 207)	39.1	22.7	27.1	11.1
Controls (n = 241)	49.0	23.2	19.1	8.7
<b>Mental Health</b>				
Cases (n = 217)	45.2	30.9	19.8	4.2
Controls (n = 252)	56.0	24.6	15.5	4.0

measure HR-QOL in both ostomates and controls. The SF-36 is a validated and widely accepted instrument for measuring HR-QOL.

In this study population, ostomates were similar to the controls in race, education, annual household income, employment, current marital status, and Charlson-Deyo Comorbidity Index. The study groups were comparable in all aspects except for the reason for surgery. IBD was more common in ostomates (24.1%) than the controls (4.3%). IBD is often associated with comorbidities and the increased rate in ostomates could possibly explain the low HR-QOL.

It is quite striking to see that although there is a functional body change in patients undergoing ostomy, more Mental Component domains were significantly different between ostomates and controls (Fig. 1). Comorbidities affected the physical functioning of the patients to a larger extent, whereas having an ostomy played a major role in the mental functioning. While the burden of the comorbidity in ostomy patients has not been well described in the literature, it is clear that the effect of comorbidity on ostomates is substantial, as the HR-QOL is generally much more affected for those with comorbidities. One of the common reasons a patient undergoes an ostomy surgery is colorectal cancer and the majority of the HR-QOL studies have focused on describing these patients [18–20]. Some HR-QOL studies have included benign etiologies such as IBD. The current study included patients with all possible etiologies for ostomy, and 50% of our study population had a benign etiology. Also, due to lack of a standardized instrument to measure HR-QOL in ostomy patients, most of the studies have used unstandardized instruments to measure Psycho-

Table 3  
Multivariate regressions for ostomates using SF-36V

Variable	≤25		>25 & ≤50		>50 & ≤75		>75 & ≤100	
	OR	95% CI	OR	95% CI	OR	95% CI	OR	95% CI
<b>Comorbidities</b>								
Physical Function	3.9*	1.89–8.27	2.7*	1.29–5.60	3.3*	1.59–6.98	1.0	—
Role Limitations–Physical	2.6*	1.20–5.50	1.6	.83–3.12	1.7	.83–3.33	1.0	—
Bodily Pain	1.4	.64–3.13	1.5	.79–2.77	1.4	.57–3.30	1.0	—
General Health	2.4*	1.20–4.88	1.7	.95–3.14	.8	.38–1.51	1.0	—
Vitality	6.7*	2.26–19.93	5.8*	2.03–16.63	2.9	.98–8.52	1.0	—
Social Function	1.8	.90–3.72	2.2*	1.20–3.92	2.4*	1.30–4.57	1.0	—
Role Limitations–Emotional	2.8*	1.24–6.53	1.0	.53–1.85	1.1	.61–2.04	1.0	—
Mental Health	1.6	.49–4.95	.8	.43–1.63	1.3	.76–2.21	1.0	—
<b>Ostomy</b>								
Physical Function	1.5	.82–2.81	1.3	.71–2.29	1.3	.73–2.38	1.0	—
Role Limitations–Physical	1.8	.90–3.43	.3	.75–2.36	.8	.47–1.51	1.0	—
Bodily Pain	.9	.43–1.77	.9	.53–1.56	.8	.38–1.79	1.0	—
General Health	2.2*	1.16–4.24	1.3	.77–2.28	.8	.45–1.45	1.0	—
Vitality	1.6	.73–3.51	.9	.43–1.88	.8	.39–1.72	1.0	—
Social Function	2.8*	1.48–5.31	1.7	.98–2.87	1.0	.54–1.71	1.0	—
Role Limitations–Emotional	2.1	.91–4.68	2.0*	1.13–3.48	1.3	.74–2.17	1.0	—
Mental Health	1.6	.54–4.52	2.0*	1.09–3.54	1.8*	1.10–2.97	1.0	—

Estimates are derived from a multinomial logistic regression model, adjusting for age, race, education, income, employment, current marital status. OR = odds ratio; CI = confidence interval.

\* Statistically significant ( $P < .05$ ).

logic and Social Functioning [7,18,21,22]. We used the SF-36V, a widely accepted standardized instrument to measure HR-QOL for ostomy patients. To our knowledge, no study has evaluated the effect on comorbidities and having an ostomy simultaneously on HR-QOL.

There are several limitations to this study. First, the study only includes patients undergoing surgery at VA hospitals and therefore may not be generalizable to non-VA hospitals. Second, the study does not include female patients due to the low numbers of women treated at VA Hospitals. The effect of comorbidity may be different in females and conclusions about this population cannot be drawn from the current study. However, this study also has several strengths including the SF-36V instrument, a large number of respondents, a control group, and heterogeneous study population. In the setting of poor sphincter function or other comorbidities, an ostomy may improve HR-QOL. While our study was not designed to examine this issue, it is clear that in our older population with multiple comorbidities some patients would fare better with an ostomy rather than a bowel anastomosis.

## Conclusions

In summary, to improve the HR-QOL of ostomates, comorbidities should be addressed appropriately. The aim of the current study was to understand which had a greater impact on HR-QOL of ostomates. We observed that high comorbidity impacted a higher number of HR-QOL domains compared to having an ostomy. Further research is needed to identify and optimize comorbidities in these patients to improve the HR-QOL. In addition, prospective studies on a non-VA population are warranted to determine that our results are consistent across gender and healthcare settings.

## References

- [1] Turnbull GB. Ostomy statistics: the \$64,000 question. *Ostomy Wound Manage* 2003;49:22–3.
- [2] Nugent KP, Daniels P, Stewart B, et al. Quality of life in stoma patients. *Dis Colon Rectum* 1999;42:1569–74.
- [3] Karadag A, Menten BB, Uner A, et al. Impact of stomatherapy on quality of life in patients with permanent colostomies or ileostomies. *Int J Colorectal Dis* 2003;18:234–8.
- [4] Silva MA, Ratnayake G, Deen KI. Quality of life of stoma patients: temporary ileostomy versus colostomy. *World J Surg* 2003;27:421–4.
- [5] Marquis P, Marrel A, Jambon B. Quality of life in patients with stomas: the Montreux study. *Ostomy Wound Manage* 2003;49:48–55.
- [6] Williams NS, Johnston D. The quality of life after rectal excision for low rectal cancer. *Br J Surg* 1983;70:460–2.
- [7] MacDonald LD, Anderson HR. Stigma in patients with rectal cancer: a community study. *J Epidemiol Community Health* 1984;38:284–90.
- [8] Kazis LE, Miller DR, Clark J, et al. Health-related quality of life in patients served by the Department of Veterans Affairs: results from the Veterans Health Study. *Arch Intern Med* 1998;158:626–32.
- [9] Kazis LE, Ren XS, Lee A, et al. Health status in VA patients: results from the Veterans Health Study. *Am J Med Qual* 1999;14:28–38.
- [10] Kazis LE, Miller DR, Clark JA, et al. Improving the response choices on the veterans SF-36 health survey role functioning scales: results from the Veterans Health Study. *J Ambul Care Manage* 2004;27:263–80.
- [11] Singh B, Bhaya M, Zimble M, et al. Impact of comorbidity on outcome of young patients with head and neck squamous cell carcinoma. *Head Neck* 1998;20:1–7.
- [12] Mangione CM, Goldman L, Orav EJ, et al. Health-related quality of life after elective surgery: measurement of longitudinal changes. *J Gen Intern Med* 1997;12:686–97.
- [13] Stojanovic M, Stefanovic V. Assessment of health-related quality of life in patients treated with hemodialysis in Serbia: Influence of comorbidity, age, and income. *Artif Organs* 2007;31:53–60.
- [14] Krouse RS, Mohler MJ, Wendel CS, et al. The VA Ostomy Health-Related Quality of Life Study: objectives, methods, and patient sample. *Curr Med Res Opin* 2006;22:781–91.
- [15] City of Hope/Beckman Research Institute Pain Resource Center Research Instruments. Available at: <http://www.cityofhope.org/prc/pdf/Quality%20of%20Life%20Ostomy.pdf>. Accessed October 20, 2006.

- [16] Ware JE Jr, Sherbourne CD. The MOS 36-Item Short-Form Health Survey (SF-36). I. Conceptual framework and item selection. *Med Care* 1992;30:473–83.
- [17] Deyo RA, Cherkin DC, Ciol MA. Adapting a clinical comorbidity index for use with ICD-9-CM administrative databases. *J Clin Epidemiol* 1992;45:613–9.
- [18] MacDonald LD, Anderson HR. The health of rectal cancer patients in the community. *Eur J Surg Oncol* 1985;11:235–41.
- [19] Sprangers MA, Taal BG, Aaronson NK, et al. Quality of life in colorectal cancer. Stoma vs. nonstoma patients. *Dis Colon Rectum* 1995;38:361–9.
- [20] Engel J, Kerr J, Schlesinger-Raab A, et al. Quality of life in rectal cancer patients: a four-year prospective study. *Ann Surg* 2003;238:203–13.
- [21] La Monica G, Audisio RA, Tamburini M, et al. Incidence of sexual dysfunction in male patients treated surgically for rectal malignancy. *Dis Colon Rectum* 1985;28:937–40.
- [22] Wirsching M, Druner HU, Herrmann G. Results of psychosocial adjustment to long-term colostomy. *Psychother Psychosom* 1975;26:245–56.

## Discussion

**Jon S. Thompson, M.D.** (Omaha, NE): The authors studied a fairly difficult, but common general surgical problem. It is particularly important that they were studying quality of life. Most of us who deal with colorectal disease understand that most of our patients would like to avoid ostomy if at all possible, but that is not always possible. In fact, modern surgical care has really led to a decrease in the use of ostomies. If you look at the management of low rectal cancers, we increasingly do low anterior resection, coloanal pull through, or even local excision. We do sphincter-sparing procedures for inflammatory bowel disease, and as you heard at this meeting yesterday, increasingly we avoid the use of colostomy for emergent colectomy. But despite all of this, there are clearly a number of patients who do require ostomies in their management.

This study appears to be part of a larger VA ostomy health-related quality of life study and done on a case control fashion and here they tried to look at the relative role of the ostomy itself versus comorbidities in terms of life assessment. The only real difference between the 2 groups that they presented, which may be clearer in the manuscript, was that there was a higher incidence of inflammatory bowel disease in the patients that had ostomies compared to those who did not. As Dr. Jain nicely demonstrated, a high associated comorbidity had a larger effect on physical function, whereas ostomy had a greater impact on mental health and, specifically, social function. They concluded that further studies should be carried out to identify some of these comorbidities that might be modified to improve quality of life. This study is an important one that should affect our thoughts about ostomies and quality of life of patients. I have the following questions for the authors:

1. The study population was males with an average age of 69. Do younger patients tend to have a different quality-of-life assessment? Do you have any information on that?
2. Secondly, in a variety of diseases, particularly inflammatory bowel disease, it has been demonstrated that quality of life actually improves after they have had the operation regardless of whether as an ostomy or

not. This might influence interpretations of your results here. Do you feel that the increased prevalence of inflammatory bowel disease in the stoma group would affect your conclusions?

3. More importantly, we all realize that there are different features about ostomies that have an effect on the quality of life and how it is perceived. My general impression has been that ileostomies are more difficult to manage than colostomies. I think we all realize that poorly constructed stomas or stomas that are poorly located on the abdominal wall can have a tremendous influence on the quality of life. Do you have any information on these factors or what kind of ostomies these patients had? Were stomal therapists involved in pre- and postoperative care of these patients to assist with factors that might influence quality of life?
4. And finally, you did a quantitative analysis on the number of comorbidities. Do you have any idea of whether there were specific comorbidities that were more important than others?

**Randy Friese, M.D.** (Dallas, TX): I wanted to make the comment that you probably would be more accurate in classifying your study as a cross-sectional study because your cases and controls are coming from the same population of patients. The classical definition of a case control is where the cases and the controls come from two different populations of patients. I do have one question for you. In your regression model, did you consider examining the effect of the interaction between ostomy and comorbidity? If the interaction term is significant, this may call into question your conclusions about the individual effects of ostomy and comorbidity on quality of life in patients who have both. I just wanted to know if you considered looking at that interaction term.

**Sushma Jain, M.D.** (Los Angeles, CA): Dr. Thompson questioned whether we looked at younger males and their quality of life. We did not particularly categorize the age category, but that is something we would be doing and we would look at in the future. The second question, the inflammatory bowel disease may have seen as you said the quality of life improves later on, but in our population, we did not. When we compared the ostomies and the controls, we did not find any significant difference as far as comorbidities were concerned. As far as the kind of ostomies we looked at, in our population there were 70% colostomies and 30% ileostomies. We do have information that we collected about comorbidities and so the next step would be to look at individual comorbidities and how they affect, but we do know that in this population that we looked at 35% of the patients had cancer, 22% had diabetes, and 18% had cardiopulmonary disease, so a future step would be to look at these comorbidities in detail and see which one has effect on ostomy more in depth.

Dr. Friese, we did not look at this time interaction between ostomy and comorbidities, but that would be interesting and we will definitely look at that in our next analysis.