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# THE IMPACT OF OBESITY ON HEALTH RELATED QUALITY OF LIFE BEFORE AND AFTER RADICAL PROSTATECTOMY (DATA FROM CaPSURE)

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## ABSTRACT

**Purpose:** Health related quality of life (HRQOL) is an important measure of outcomes among patients with prostate cancer due to disease related and treatment related effects on physical and emotional health. We determined if there are differences in the HRQOL of obese men at diagnosis and after radical prostatectomy compared to the HRQOL of men with normal body mass index (BMI).

**Materials and Methods:** Data were abstracted from Cancer of the Prostate Strategic Urological Research Endeavor (CaPSURE), a disease registry of 10,018 men with prostate cancer. A total of 1,884 men were included in study who were treated with radical prostatectomy between 1989 and 2002, had BMI information available and had completed 1 initial HRQOL questionnaire. Of these men 672 who completed at least 2 followup questionnaires were assessed further.

**Results:** The BMI (kg/m<sup>2</sup>) distributions were 24% normal (less than 24.9 kg/m<sup>2</sup>), 56% overweight (25 to 29.9), 16% obese (30 to 34.9) and 4% very obese (greater than 35 kg/m<sup>2</sup>). Higher BMI was associated with worse physical function, bodily pain, general health, vitality and role physical, but better bowel bother at diagnosis independent of race. Higher BMI was also associated with worse HRQOL after radical prostatectomy for physical function, general health and vitality, but better bowel bother. HRQOL differences between BMI groups were similar among times for all measured variables. Compared to the normal group, the higher BMI groups had similar HRQOL after radical prostatectomy.

**Conclusions:** In the majority of domains men with higher BMI had lower HRQOL at diagnosis than men of normal BMI. Obese men have a similar recovery pattern of HRQOL after radical prostatectomy, with minimal additive long-term impairment in HRQOL relative to men of normal weight.

**KEY WORDS:** quality of life, obesity, prostatic neoplasms, prostatectomy

During the last several decades the incidence of obesity in the United States has dramatically increased from 12.8% to 30.5% of adult Americans between 1991 and 2000.<sup>1,2</sup> Many medical conditions are known to occur more commonly in obese patients, including diabetes, cardiovascular disease, pulmonary disease and some cancers.<sup>3</sup> Obesity is the second most common cause of preventable death in the United States.<sup>4</sup>

Health related quality of life (HRQOL) is important to measure in patients with prostate cancer due to disease related and treatment related effects on pain, general health, sexual function, bladder function and bowel function.<sup>5,6</sup> While obese men in the general population have a lower HRQOL,<sup>7</sup> the impact of obesity on HRQOL in patients diagnosed with prostate cancer is unknown and, in general, the association between obesity and prostate cancer is controversial and not completely understood.<sup>8,9</sup> Men treated for prostate cancer frequently have an immediate posttreatment reduction in HRQOL followed by an improvement to near pretreatment levels within 1 year.<sup>10</sup> However, the magnitude of this response in obese patients is not known and these patients may have worse HRQOL outcomes after prostate cancer treatment. In this study we determined

whether obese patients diagnosed with prostate cancer have a lower HRQOL at diagnosis and whether the post-prostatectomy HRQOL pattern of obese patients differs from that of normal weight men.

## METHODS

The study population was drawn from the CaPSURE database, a longitudinal, observational registry of 10,018 men with biopsy proven prostate cancer. Data are collected from participant questionnaires and medical records at 34 community based practices, 3 academic and 3 Veterans Administration clinical sites across the United States. Clinical data (medical history, tumor stage, prostate specific antigen [PSA], treatment) are provided by the urologist at clinical encounters. Subjects report baseline HRQOL data at entry and every 3 to 6 months thereafter.<sup>11</sup>

Of these 10,018 men 3,486 underwent radical prostatectomy (RP) as primary treatment, and had height and weight data available at diagnosis. We assessed the preoperative self-reported HRQOL in 1,884 men who underwent radical prostatectomy for localized prostate cancer without any neoadjuvant or adjuvant therapy ("before RP"). Of these 1,884 patients we also assessed the relationship between preoper-

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ative and postoperative self-reported HRQOL in 672 who had at least 2 followup visits ("before and after RP").

Obesity was quantified by calculating body mass index (BMI) for each patient ( $\text{kg}/\text{m}^2$ ) at diagnosis. Patients were divided based on BMI at diagnosis into 4 categories of normal (less than  $25 \text{ kg}/\text{m}^2$ ), overweight ( $25$  to  $29.9 \text{ kg}/\text{m}^2$ ), obese ( $30$  to  $34.9 \text{ kg}/\text{m}^2$ ) and very obese ( $35 \text{ kg}/\text{m}^2$  or greater).<sup>12</sup> Patients in this analysis were classified according to pretreatment risk using a modification of the D'Amico risk classification,<sup>13</sup> namely high (PSA greater than  $20 \text{ ng}/\text{ml}$ , Gleason sum greater than  $7$ , primary Gleason pattern  $4$  or  $5$ , or clinical stage T3a), intermediate (PSA  $10.1$  to  $20 \text{ ng}/\text{ml}$ , Gleason sum  $7$ , secondary Gleason pattern  $4$  or  $5$ , or clinical stage T2b/c) and low (PSA  $10 \text{ ng}/\text{ml}$  or less, Gleason sum (less than  $7$  without pattern  $4$  or  $5$  and clinical stage T1 or T2a).

For the analysis of the "before RP" group we included patients who had a preoperative questionnaire completed up to 4 months before radical prostatectomy. For analysis of the "before and after RP" group we only included patients with a preoperative and at least 2 postoperative followup questionnaires (completed between 6 and 24 months after radical prostatectomy). If more than 1 questionnaire was available for the preoperative period, we used the questionnaire completed nearest the time of surgery.

We measured general and disease specific HRQOL with 2 instruments. General HRQOL was assessed with the RAND 36-Item Health Survey, version 1.0, a 36-item questionnaire which quantifies general physical and mental HRQOL.<sup>14</sup> In this analysis we examined the general health outcomes of physical function, general health, bodily pain, vitality, social functioning, mental health, physical role (limitations due to physical problems), emotional role (limitations due to emotional problems), and physical and mental component summary scores. Disease specific HRQOL was assessed with the UCLA Prostate Cancer Index.<sup>6</sup> This index is a self-administered 20-item questionnaire which quantifies prostate cancer specific HRQOL in 6 domains including urinary, bowel, and sexual function and bother, and is scored from 0 to 100, with 100 representing optimal health or functioning. We examined all symptom specific outcomes (urinary function/bother, sexual function/bother, bowel function/bother) and all outcomes are scored so that higher values indicate better quality of life.

Comorbidity was assessed with an 11-item medical history questionnaire as previously described.<sup>15,16</sup> Univariate analyses used the chi-square test for categorical variables and ANOVA for continuous variables to examine the relationship of BMI categories with other clinical and sociodemographic study variables. The association of BMI with HRQOL outcomes was analyzed using a repeated measures model to take into account the correlation of repeated outcomes among patients. In addition, it handles missing values and truncation in an optimal way by taking the time patterns of the available data into account. The repeated measures model included BMI categories (normal, overweight, obese and very obese), time period (pretreatment, 6, 12, 18 and 24 months), and interaction between BMI and time, and was adjusted for comorbidity. The interaction term was used to determine whether patterns of HRQOL differ after RP by BMI. For example, obese patients may have a greater decrease in HRQOL after RP than nonobese patients. No adjustments were made for multiple comparisons. All analyses were performed using SAS version 8.2 (SAS Institute, Cary, North Carolina) with  $p \leq 0.05$  considered statistically significant.

## RESULTS

*Effect of obesity on HRQOL at diagnosis.* Of the 1,884 men analyzed the BMI distribution was 24% normal, 56% overweight, 16% obese and 4% very obese. Patient demographics are given in table 1. Having more comorbid conditions was more common with increasing BMI group ( $p = 0.0001$ ). Patients in different BMI groups did not differ regarding race, patient age, marital status, household income or pretreatment predicted risk of cancer recurrence. There was an inverse trend between BMI group and education level ( $p = 0.011$ ). Since black race is a known factor related to lower HRQOL in patients with prostate cancer,<sup>17</sup> we determined if obesity impacted HRQOL independent of race. In multivariate analysis adjusting for race, increasing BMI was associated with worse physical function, bodily pain, general health, vitality, and physical component summary (all  $p < 0.001$ ), and statistically significant for worse role physical ( $p = 0.045$ ) and better bowel bother ( $p = 0.036$ ). Black race was associated with poorer HRQOL after adjusting for BMI in 9 domains of physical function ( $p = 0.002$ ), bodily pain

TABLE 1. Patient demographics

	Normal	Overweight	Obese	Very Obese	p Value
Mean age at diagnosis $\pm$ SD	61.7 $\pm$ 7.2	61.7 $\pm$ 6.9	62.1 $\pm$ 6.1	60.6 $\pm$ 5.8	0.83
Race (%):					0.43
White	94.9	95.3	92.1	89.7	
Black	5.1	4.7	7.9	10.3	
Comorbidities (%):					0.0001
0-1	65.0	61.7	45.2	41.4	
2-3	30.1	34.3	44.2	37.9	
4 or More	4.9	4.0	10.6	20.7	
Marital status (%):					0.76
Married/significant other	95.1	94.9	91.4	93.1	
Single/divorced/widowed	4.9	4.8	8.6	6.9	
Education level (%):					0.011
High school or less	30.7	33.0	40.4	41.4	
Some college	16.0	20.2	26.0	17.3	
College graduate	20.9	16.5	15.4	27.6	
Graduate/professional school	32.5	30.3	18.3	13.8	
Yearly household income (%):					0.77
Unknown	4.9	5.9	7.7	3.5	
Less than \$20,000	6.8	6.7	7.7	6.9	
\$20,000-\$50,000	35.2	32.5	40.4	44.8	
Greater than \$50,000	53.1	54.8	44.2	44.8	
Recurrence risk at diagnosis (%):*					0.24
Low	44.8	45.8	39.1	68.0	
Intermediate	40.0	37.9	41.5	16.0	
High	15.2	16.4	19.6	16.0	

\* Recurrence risk determined using modification of the nomograms of D'Amico et al,<sup>13</sup> namely high (PSA greater than  $20 \text{ ng}/\text{ml}$ , Gleason sum greater than  $7$ , primary Gleason pattern  $4$  or  $5$ , or clinical stage T3a), Gleason sum  $7$ , secondary Gleason pattern  $4$  or  $5$ , clinical stage T2b/c) and low (PSA  $10 \text{ ng}/\text{ml}$  or less, Gleason sum less than  $7$  without pattern  $4$  or  $5$  and clinical stage T1 or T2a).

( $p = 0.001$ ), general health ( $p < 0.001$ ), physical component summary ( $p = 0.025$ ), social functioning ( $p = 0.003$ ), role emotional ( $p = 0.018$ ), urinary bother ( $p = 0.002$ ), sexual bother ( $p = 0.04$ ) and bowel function ( $p = 0.004$ , table 2).

*Effect of obesity on HRQOL before and after RP.* Of the 672 men analyzed the BMI distribution was 29% normal, 50% overweight, 16% obese and 5% very obese. A summary of HRQOL variables before treatment and at 6, 12, 18 and 24 months after radical prostatectomy are given in tables 3 to 5. Increasing BMI group was associated with poorer physical function, general health, vitality, physical component summary and better bowel bother before and after radical prostatectomy. However, the differences in HRQOL among BMI groups for all variables were similar among time points. Compared to the normal group, the higher BMI groups did not have worsening HRQOL after radical prostatectomy. Urinary function and bother were similar at all times between all BMI groups except at 24 months, when very obese patients had significantly lower HRQOL. HRQOL trends over time for physical function, bowel function and bowel bother are provided in figures 1 to 3, respectively.

#### DISCUSSION

The incidence of obesity has increased dramatically in the United States during the last 2 decades from 13% in 1980 to 30% in 2000.<sup>1,2</sup> An additional 40% of Americans in 2002 were overweight.<sup>1</sup> Due to higher rates of multiple comorbid diseases, obese individuals have higher rates of morbidity and mortality.<sup>3</sup> Most of these comorbid conditions are reversible and obesity is now considered one of the most common causes of preventable death in the United States.<sup>4</sup>

In prior studies obese men have been found to be more likely to suffer from incontinence<sup>18</sup> and erectile dysfunction.<sup>19</sup> Obese men older than 65 years are also more likely to have lower overall HRQOL.<sup>7</sup> However, the impact of prostate cancer and radical prostatectomy on the genitourinary function and HRQOL of obese patients is not known. Like other prostate cancer treatments radical prostatectomy has been associated with increased urinary incontinence, erectile dysfunction and decreased HRQOL.<sup>10,20</sup> Due to higher rates of comorbidities and lower HRQOL at baseline, radical prostatectomy in obese patients may synergistically worsen HRQOL in these patients.

In our study of 8 generic health categories, increasing BMI was associated with worse HRQOL at diagnosis in 5 do-

main. These HRQOL differences were independent of the effect of ethnicity. At diagnosis obesity was related to worse patient reported physical health with little or no difference observed in emotional health. Of the generic health HRQOL variables, obese patients reported worse HRQOL in all 4 physical health domains (physical functioning, bodily pain, general health, vitality). Of the 4 emotional health domains 1 (role physical) was lower in obese patients and statistically significant ( $p = 0.045$ ). Likewise, physical component summary was significantly different among BMI groups while mental component summary was not. These differences in HRQOL may be due to the higher number of comorbid medical conditions observed in patients with higher BMI in our study (table 1). Obese patients in our study appear to have at least equivalent urinary, sexual and bowel symptoms at diagnosis. In our series higher BMI was associated with better patient reported bowel bother at diagnosis. It is unclear why bowel bother is better in obese patients. It is possible that the burden of health issues is greater for obese patients so that an equivalent area of function may be perceived to be better by obese patients. It is also possible that obese patients are more accustomed to health problems and are not bothered by bowel changes. Since radical prostatectomy typically does not cause much bowel morbidity, it is unclear if these differences in bowel symptoms are clinically important. Contrary to our expectations, sexual bother and function were not different among groups. Black ethnicity independently predicted worse urinary bother, bowel function and sexual bother, which is consistent with our previous study.<sup>17</sup>

In the generic health domains patients with higher BMI had lower HRQOL across all measured times in 3 of 4 physical health variables (physical functioning, general health, vitality) and the physical component summary, and none of the emotional health variables. In the genitourinary specific domains 1 of 6 variables (bowel bother) was better across all time intervals and all other variables were similar among BMI groups. These differences in HRQOL across time are similar to those seen at diagnosis. HRQOL was generally worse at 6 months after prostatectomy compared to pretreatment. At 12, 18 and 24 months after surgery HRQOL improved in all domains, nearing or surpassing pretreatment values. This pattern, which has been previously described,<sup>10</sup> was observed in all BMI groups. Additionally, the size differences in HRQOL

TABLE 2. Multivariate analysis of HRQOL at diagnosis, and effect of race and obesity

	Mean $\pm$ SD				p Value (BMI)	p Value (black race)
	Normal	Overweight	Obese	Very Obese		
	(482)	(960)	(335)	(107)		
RAND 36-item health survey:						
Physical function	84.4 $\pm$ 22.6	85.0 $\pm$ 20.8	79.8 $\pm$ 23.2	72.4 $\pm$ 24.6	<0.001*	0.002*
Bodily pain	84.9 $\pm$ 20.7	84.0 $\pm$ 19.8	79.1 $\pm$ 21.9	78.4 $\pm$ 24.6	<0.001*	0.001*
General health	71.1 $\pm$ 21.0	72.0 $\pm$ 19.5	67.6 $\pm$ 20.0	64.8 $\pm$ 22.2	<0.001*	<0.001*
Vitality	66.9 $\pm$ 20.3	66.6 $\pm$ 19.7	61.8 $\pm$ 19.7	60.7 $\pm$ 22.5	<0.001*	0.91
Physical component Summary score	50.6 $\pm$ 9.7	50.8 $\pm$ 8.9	48.5 $\pm$ 9.7	46.5 $\pm$ 10.7	<0.001*	0.025*
Social functioning	86.1 $\pm$ 20.6	86.7 $\pm$ 20.6	86.7 $\pm$ 20.3	82.3 $\pm$ 24.5	0.33	0.003*
Role physical	75.1 $\pm$ 38.3	78.3 $\pm$ 35.8	74.9 $\pm$ 37.1	68.5 $\pm$ 41.0	0.045*	0.055
Role emotional	78.7 $\pm$ 25.6	80.9 $\pm$ 34.1	79.5 $\pm$ 34.2	73.6 $\pm$ 39.1	0.27	0.018*
Mental health	76.8 $\pm$ 16.8	77.7 $\pm$ 16.5	76.8 $\pm$ 18.0	73.3 $\pm$ 20.7	0.35	0.129
Mental component Summary score	51.0 $\pm$ 9.7	51.4 $\pm$ 9.8	51.7 $\pm$ 9.6	50.5 $\pm$ 11.6	0.55	0.67
UCLA Prostate Cancer Index survey:						
Urinary function	91.8 $\pm$ 13.9	91.8 $\pm$ 13.3	90.4 $\pm$ 15.7	88.5 $\pm$ 19.1	0.069	0.099
Urinary bother	82.3 $\pm$ 24.8	83.2 $\pm$ 25.3	83.1 $\pm$ 25.6	80.7 $\pm$ 25.2	0.69	0.002*
Bowel function	87.3 $\pm$ 15.1	87.4 $\pm$ 14.0	86.9 $\pm$ 13.7	86.9 $\pm$ 15.0	0.99	0.004*
Bowel bother	86.1 $\pm$ 22.8	88.5 $\pm$ 21.4	89.1 $\pm$ 20.7	90.4 $\pm$ 19.1	0.036*	0.99
Sexual function	48.7 $\pm$ 29.4	49.3 $\pm$ 30.0	48.4 $\pm$ 29.5	43.1 $\pm$ 30.5	0.40	0.58
Sexual bother	59.7 $\pm$ 38.3	58.5 $\pm$ 38.4	59.3 $\pm$ 38.4	49.8 $\pm$ 40.4	0.14	0.040*

p Values based on repeated measures analysis adjusted for race and BMI group.

\* Significant at  $p = 0.05$ .

TABLE 3. HRQOL scores before and 6, 12, 18 and 24 months after treatment (physical health measures by BMI group)

	Mean ± SD				Difference Between BMI Groups (p value before + after treatment)	Differences Between BMI Groups Changing With Time (treatment effect p value)
	Normal (163)	Overwt (376)	Obese (104)	Very Obese (29)		
Physical functioning:					0.001*	0.57
Pretreatment	91.3 ± 15.4	91.0 ± 15.8	84.6 ± 20.0	78.5 ± 22.4		
6 Mos	86.9 ± 18.0	86.1 ± 19.7	82.1 ± 21.9	77.8 ± 20.0		
12 Mos	90.9 ± 15.1	90.7 ± 16.3	86.5 ± 18.3	81.4 ± 23.0		
18 Mos	90.3 ± 16.6	90.5 ± 16.1	86.8 ± 16.6	84.3 ± 20.0		
24 Mos	88.7 ± 19.2	90.1 ± 17.2	86.6 ± 20.1	86.5 ± 17.9		
Bodily pain:					0.057	0.88
Pretreatment	88.6 ± 17.3	88.4 ± 17.2	83.8 ± 19.5	79.8 ± 25.4		
6 Mos	83.2 ± 21.2	83.8 ± 20.6	78.6 ± 23.5	72.4 ± 26.6		
12 Mos	87.3 ± 18.0	87.4 ± 18.5	83.0 ± 18.7	81.6 ± 20.3		
18 Mos	85.4 ± 19.1	85.5 ± 18.3	82.8 ± 20.7	86.5 ± 17.4		
24 Mos	86.5 ± 20.1	84.1 ± 20.0	85.3 ± 19.9	84.6 ± 17.2		
General health:					0.009*	0.75
Pretreatment	75.4 ± 19.0	77.0 ± 17.7	71.4 ± 18.0	66.9 ± 20.5		
6 Mos	74.4 ± 19.1	78.0 ± 17.6	73.5 ± 17.6	66.1 ± 26.7		
12 Mos	75.6 ± 18.9	77.7 ± 19.1	74.7 ± 16.5	71.6 ± 20.3		
18 Mos	73.6 ± 21.0	77.4 ± 16.2	72.3 ± 17.6	74.3 ± 19.6		
24 Mos	73.7 ± 21.6	74.3 ± 18.4	74.2 ± 18.6	73.8 ± 14.3		
Vitality:					0.025*	0.45
Pretreatment	70.8 ± 18.5	70.5 ± 19.0	64.4 ± 17.4	69.8 ± 18.4		
6 Mos	66.3 ± 19.5	66.6 ± 19.7	62.1 ± 18.8	65.9 ± 20.0		
12 Mos	69.1 ± 18.7	70.4 ± 18.5	65.3 ± 18.1	65.7 ± 14.8		
18 Mos	69.5 ± 18.8	70.3 ± 18.0	61.9 ± 20.7	66.7 ± 17.5		
24 Mos	70.6 ± 19.5	70.0 ± 17.6	66.7 ± 20.2	69.6 ± 15.7		
Physical component summary score:					0.004*	0.30
Pretreatment	53.4 ± 7.3	53.7 ± 7.2	51.1 ± 8.4	47.0 ± 10.7		
6 Mos	49.2 ± 9.4	50.2 ± 9.2	48.6 ± 10.1	43.9 ± 10.7		
12 Mos	52.2 ± 7.9	52.7 ± 7.6	51.0 ± 7.7	48.0 ± 10.3		
18 Mos	51.7 ± 7.8	52.0 ± 7.6	51.5 ± 8.1	51.1 ± 7.1		
24 Mos	51.2 ± 9.6	51.4 ± 8.3	51.7 ± 9.4	52.5 ± 6.7		

p Values based on repeated measures analysis.  
 \* Results significantly different at p = 0.05.

TABLE 4. HRQOL scores before and 6, 12, 18 and 24 months after treatment (emotional health measures by BMI group)

	Mean ± SD				Difference Between BMI Groups (p value before + after treatment)	Differences Between BMI Groups Changing With Time (treatment effect p value)
	Normal (163)	Overwt (376)	Obese (104)	Very Obese (29)		
Social functioning:					0.094	0.14
Pretreatment	88.8 ± 18.0	89.8 ± 19.2	88.7 ± 18.4	85.3 ± 21.1		
6 Mos	83.1 ± 23.6	84.4 ± 22.2	80.4 ± 26.3	87.0 ± 21.8		
12 Mos	87.9 ± 18.3	91.8 ± 17.0	89.8 ± 17.3	90.6 ± 16.1		
18 Mos	90.7 ± 19.9	91.7 ± 15.7	87.4 ± 20.2	90.8 ± 14.5		
24 Mos	91.9 ± 19.0	90.7 ± 17.5	85.3 ± 21.4	84.4 ± 21.4		
Role physical:					0.22	0.14
Pretreatment	83.2 ± 32.4	86.9 ± 28.5	81.4 ± 31.8	64.7 ± 45.0		
6 Mos	64.2 ± 43.1	69.0 ± 41.6	62.4 ± 44.7	55.4 ± 43.9		
12 Mos	81.7 ± 34.6	84.9 ± 30.0	84.7 ± 29.7	78.6 ± 38.9		
18 Mos	83.0 ± 34.0	85.3 ± 29.5	83.4 ± 34.0	91.7 ± 26.1		
24 Mos	83.3 ± 19.0	82.8 ± 32.2	84.2 ± 32.2	88.5 ± 28.1		
Role emotional:					0.33	0.20
Pretreatment	81.6 ± 32.8	84.0 ± 30.8	79.5 ± 35.1	82.8 ± 36.3		
6 Mos	84.1 ± 33.7	81.7 ± 34.7	75.2 ± 37.9	84.1 ± 33.1		
12 Mos	87.9 ± 28.4	88.8 ± 27.2	89.8 ± 25.7	91.7 ± 25.0		
18 Mos	87.6 ± 28.3	91.0 ± 23.7	79.5 ± 37.4	93.3 ± 18.6		
24 Mos	93.1 ± 23.7	88.7 ± 27.6	84.2 ± 32.1	82.1 ± 35.0		
Mental health:					0.12	0.18
Pretreatment	77.5 ± 15.8	78.6 ± 16.3	76.2 ± 17.7	76.1 ± 19.6		
6 Mos	81.1 ± 13.9	81.4 ± 15.8	73.5 ± 15.8	82.2 ± 13.6		
12 Mos	81.2 ± 14.3	82.5 ± 15.0	81.0 ± 14.6	85.9 ± 11.2		
18 Mos	82.8 ± 14.8	83.6 ± 13.3	77.7 ± 18.6	83.7 ± 12.6		
24 Mos	81.7 ± 15.9	82.4 ± 14.2	78.7 ± 16.7	77.0 ± 16.4		
Mental component summary score:					0.10	0.055
Pretreatment	51.2 ± 9.1	51.5 ± 9.8	51.1 ± 10.1	52.8 ± 10.5		
6 Mos	52.8 ± 8.7	52.5 ± 9.4	51.0 ± 9.5	55.1 ± 7.9		
12 Mos	52.8 ± 8.0	53.8 ± 8.3	53.4 ± 7.9	55.9 ± 7.2		
18 Mos	53.7 ± 8.2	54.4 ± 7.4	50.8 ± 10.6	54.6 ± 5.5		
24 Mos	51.2 ± 8.1	53.8 ± 8.3	51.5 ± 9.7	50.7 ± 11.5		

p Values based on repeated measures analysis.

among BMI groups did not increase or decrease with time. These results suggest that HRQOL differences among BMI groups are minimal at diagnosis and remain small after radical prostatectomy, with HRQOL responses in obese

patients similar to those observed in patients of normal weight. Urinary function and bother may be worse among the very obese. However, this difference was only seen at 24 months and did not represent a trend over time. Radical

TABLE 5. HRQOL scores and trends before and 6, 12, 18 and 24 months after treatment (disease specific measures by BMI group)

	Mean ± SD				Difference Between BMI Groups? (p value before + after treatment)	Differences Between BMI Groups Changing With Time? (treatment effect p value)
	Normal (167)	Overwt (383)	Obese (108)	Very Obese (29)		
Urinary function:					0.71	0.11
Pretreatment	92.2 ± 14.1	93.5 ± 11.7	93.1 ± 12.2	90.5 ± 15.5		
6 Mos	61.8 ± 25.7	63.9 ± 26.0	63.7 ± 29.5	69.0 ± 19.5		
12 Mos	73.9 ± 23.2	76.0 ± 22.2	75.3 ± 23.3	81.5 ± 18.6		
18 Mos	75.6 ± 21.0	78.7 ± 21.0	72.1 ± 24.8	76.9 ± 21.4		
24 Mos	79.1 ± 20.7	76.8 ± 20.8	78.7 ± 18.3	66.9 ± 26.2		
Urinary bother:					0.96	0.22
Pretreatment	86.1 ± 22.4	86.7 ± 21.5	85.8 ± 24.0	81.9 ± 21.0		
6 Mos	67.6 ± 28.6	67.0 ± 29.3	70.0 ± 29.3	73.9 ± 27.6		
12 Mos	79.2 ± 24.6	79.9 ± 25.3	80.1 ± 23.9	83.9 ± 23.7		
18 Mos	81.8 ± 24.0	84.9 ± 21.5	77.7 ± 24.8	75.0 ± 28.3		
24 Mos	85.4 ± 20.0	84.1 ± 21.9	85.1 ± 21.0	71.2 ± 28.5		
Bowel function:					0.22	0.97
Pretreatment	87.1 ± 16.0	89.3 ± 12.8	87.0 ± 14.3	90.7 ± 13.0		
6 Mos	85.4 ± 16.7	87.1 ± 14.7	85.1 ± 15.8	84.7 ± 21.6		
12 Mos	88.6 ± 13.6	90.1 ± 12.2	89.2 ± 11.5	89.9 ± 12.4		
18 Mos	88.6 ± 14.2	90.0 ± 12.6	88.4 ± 12.7	92.0 ± 9.6		
24 Mos	88.0 ± 15.7	88.5 ± 13.7	91.6 ± 11.0	90.3 ± 7.2		
Bowel bother:					0.004*	0.85
Pretreatment	86.8 ± 23.5	92.7 ± 17.3	89.5 ± 21.3	95.7 ± 11.7		
6 Mos	82.4 ± 25.4	87.9 ± 21.4	85.0 ± 23.0	89.1 ± 23.6		
12 Mos	86.7 ± 23.6	92.3 ± 16.9	89.0 ± 18.8	92.0 ± 16.7		
18 Mos	85.3 ± 26.3	91.0 ± 19.0	88.9 ± 20.0	95.0 ± 14.0		
24 Mos	88.5 ± 23.4	89.9 ± 18.9	94.5 ± 12.4	96.2 ± 9.3		
Sexual function:					0.97	0.25
Pretreatment	57.5 ± 28.1	59.4 ± 26.8	59.1 ± 24.5	52.0 ± 31.3		
6 Mos	17.9 ± 19.1	19.0 ± 20.6	20.9 ± 22.8	19.1 ± 25.1		
12 Mos	23.0 ± 20.8	24.6 ± 21.7	23.5 ± 22.9	26.4 ± 24.4		
18 Mos	29.4 ± 24.8	28.3 ± 24.1	27.7 ± 23.5	40.5 ± 26.4		
24 Mos	29.1 ± 25.1	29.3 ± 24.6	30.1 ± 23.4	20.4 ± 31.1		
Sexual bother:					0.99	0.25
Pretreatment	64.3 ± 35.9	66.3 ± 35.5	68.0 ± 32.5	57.1 ± 44.02		
6 Mos	34.4 ± 32.8	31.3 ± 36	25.8 ± 35.4	35.9 ± 39.0		
12 Mos	34.9 ± 35.0	33.9 ± 34.9	31.2 ± 36.6	32.7 ± 38.5		
18 Mos	39.7 ± 36.8	38.0 ± 34.9	33.3 ± 36.8	46.4 ± 33.7		
24 Mos	39.1 ± 37.3	40.4 ± 3.6	41.5 ± 40.5	56.3 ± 46.6		

p Values based on repeated measures analysis.  
 \* Results significantly different at p = 0.05.

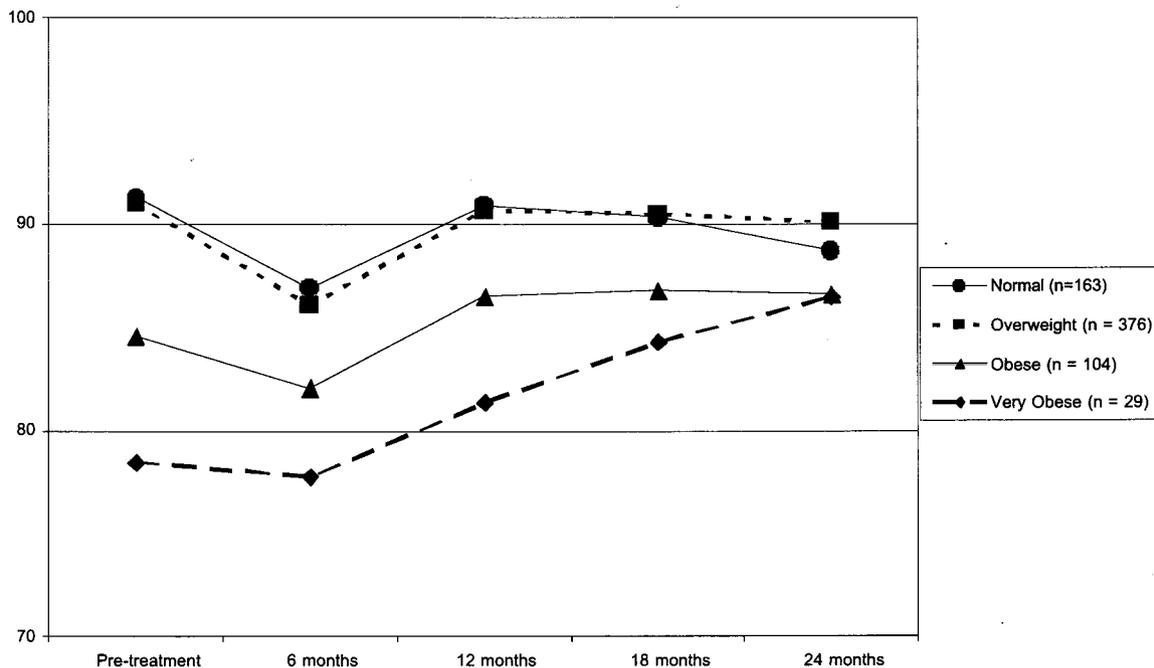


FIG. 1. Physical functioning is worse for men with higher BMI at diagnosis (p = 0.001). Treatment impact is similar for all BMI groups with time (p = 0.57).

prostatectomy generally does not have a worse effect on HRQOL among patients with higher BMI.

Our study has several potential weaknesses. By exam-

ining multiple HRQOL variables in a large population, the possibility increases of finding a significant difference by chance (type I error). In our study p values between 0.01

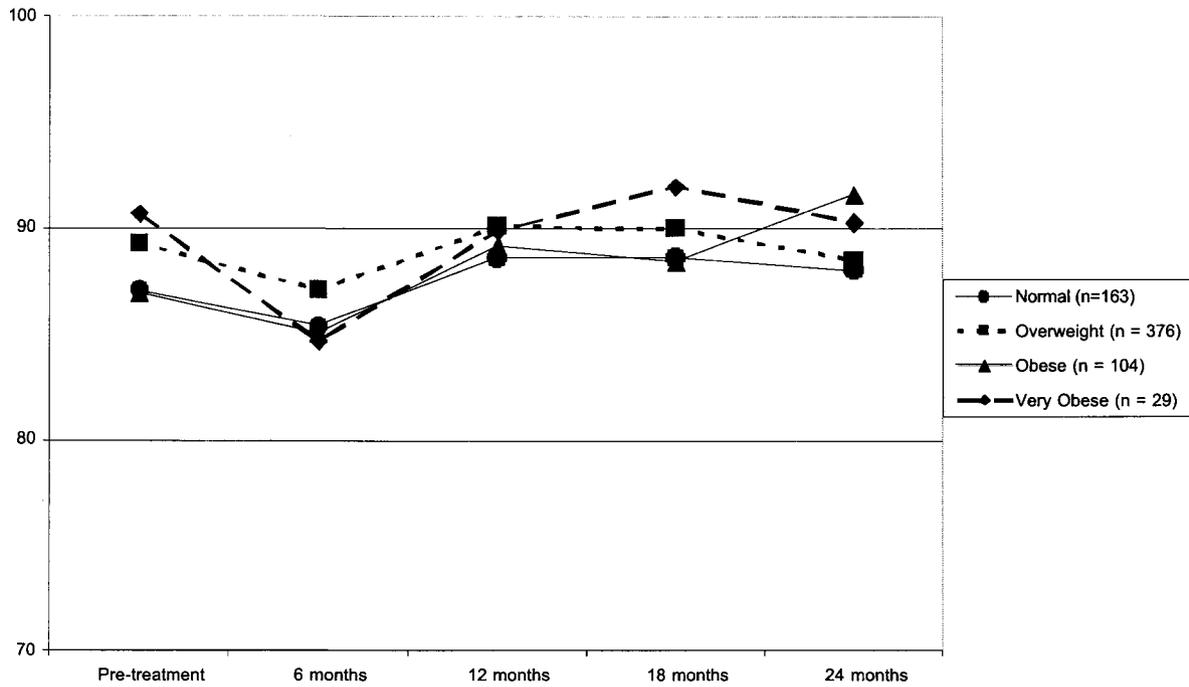


FIG. 2. Bowel function is similar among BMI groups at diagnosis ( $p = 0.22$ ) and treatment impact is similar for all BMI groups with time ( $p = 0.97$ ).

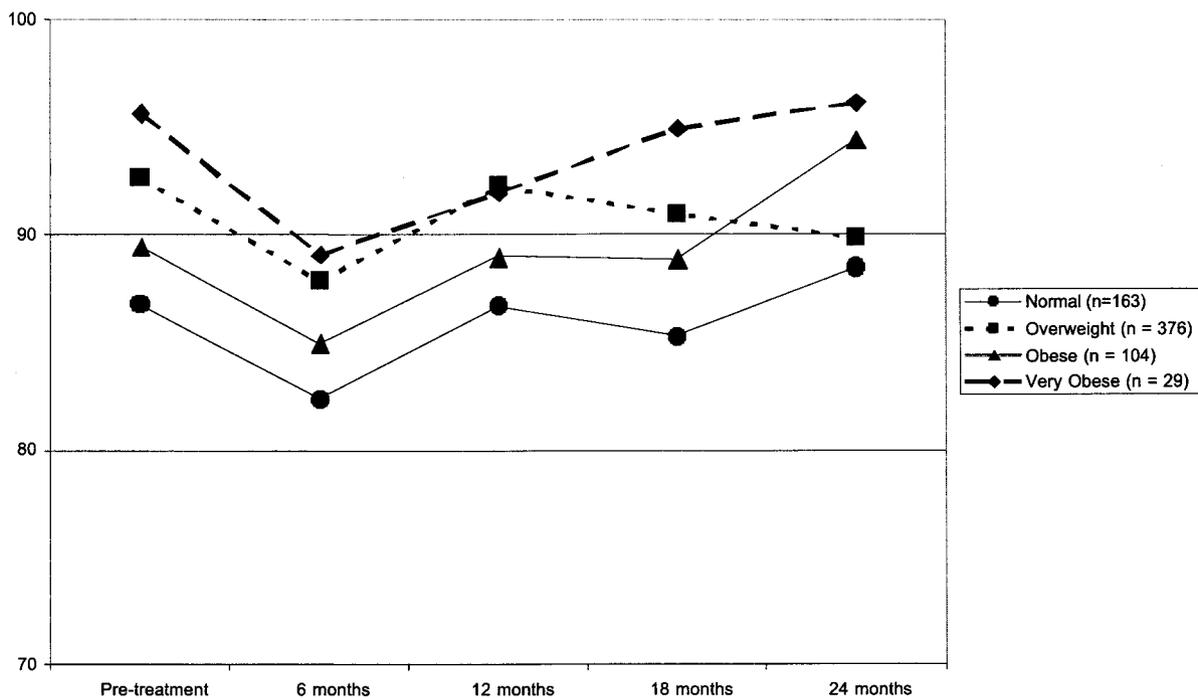


FIG. 3. Bowel bother is better in men with higher BMI at diagnosis ( $p = 0.004$ ). Treatment impact is similar for all BMI groups with time ( $p = 0.85$ ).

and 0.05 should be considered preliminary results. Given the large size of the CaPSURE database and the uniqueness of our study, we believe that our results are an important contribution to understanding the optimal treatment of prostate cancer. Additionally, since we did not control for multiple measures in our analyses, we cannot make conclusions about differences between specific weight groups, only general trends involving all weight groups. Finally, the CaPSURE database is not a random sampling of patients with prostate cancer and may not

represent all patients diagnosed with prostate cancer. Our observations suggest that obese patients diagnosed with prostate cancer can be treated with radical prostatectomy with similar responses in HRQOL as those seen in normal weight patients. The differences in HRQOL at diagnosis and over time among BMI groups in our study, while statistically significant, were often small and may not be clinically relevant. From a quality of life standpoint, radical prostatectomy is safe and no more morbid when performed on obese patients.

## CONCLUSIONS

Although there were a few domains in which obese men had higher HRQOL at diagnosis, in the majority of domains their HRQOL was lower than that of men of normal BMI. While obesity is generally correlated with lower HRQOL before and after radical prostatectomy, obese men have a recovery of HRQOL similar to that of normal weight patients, with minimal long-term detriment in HRQOL. Radical prostatectomy does not lead to worse HRQOL in obese patients compared to men with normal BMI.

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