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The perspective of prostate cancer patients and patients' partners on the psychological burden of androgen deprivation and the dyadic adjustment of prostate cancer couples

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Abstract

***Objective*: Prostate cancer and its treatments, particularly androgen deprivation therapy (ADT), affect both patients and partners. This study assessed how prostate cancer treatment type, patient mood, and sexual function related to dyadic adjustment from patient and partner perspectives.**

***Methods*: Men with prostate cancer ($n = 206$) and partners of men with prostate cancer ($n = 66$) completed an online survey assessing the patients' mood (profile of mood states short form), their dyadic adjustment (dyadic adjustment scale), and sexual function (expanded prostate cancer index composite).**

***Results*: Analyses of covariance found that men on ADT reported better dyadic adjustment compared with men not on ADT. Erectile dysfunction was high for all patients, but a multivariate analysis of variance found that those on ADT experienced greater bother at loss of sexual function than patients not on ADT, suggesting that loss of libido when on ADT does not mitigate the psychological distress associated with loss of erections. In a multiple linear regression, patients' mood predicted their dyadic adjustment, such that worse mood was related to worse dyadic adjustment. However, more bother with patients' overall sexual function predicted lower relationship scores for the patients, while the patients' lack of sexual desire predicted lower dyadic adjustment for partners.**

***Conclusions*: Both patients and partners are impacted by the prostate cancer treatment effects on patients' psychological and sexual function. Our data help clarify the way that prostate cancer treatments can affect relationships and that loss of libido on ADT does not attenuate distress about erectile dysfunction. Understanding these changes may help patients and partners maintain a co-supportive relationship.**

Background

Prostate cancer (PCa) is often referred to as a couple's disease [1–4]. There have been many studies addressing the impact of PCa on patients, partners, and their relationships but fewer on the effects of different treatment modalities. Improved screening and advances in treatment mean that men with PCa are now diagnosed earlier and live longer after treatment than ever before [5]. As a result, men are also living longer with the adverse effects of those treatments. The physical side effects of PCa treatments are well documented, but less attention has been paid to the emotional and relationship impacts of these treatments. Here, we explore the relational impact of prostate cancer and its treatments.

Of particular concern are the effects of androgen deprivation therapy (ADT) [6]. Androgen deprivation, achieved with luteinizing hormone-releasing hormone (LHRH) agonists (or antagonists), leads to a wealth of adverse effects that are linked to anxiety and depression in patients [7,8]. In addition to physical changes (e.g., hot flashes, weight gained as fat, and loss of body hair), patients on ADT experience sexual (loss of libido and loss of erections) and emotional side effects (fatigue, depression, and increased moodiness). These side effects can negatively impact patients' quality of life and, indirectly, the quality of life of their partners [9–11].

While many patients diagnosed with PCa have negative emotional responses, evidence has accumulated that patients receiving ADT experience more adverse effects on mood, most notably higher levels of depression [7,12–14] over and above those experienced by PCa patients not on ADT. Based on what is known about testosterone supplementation, specifically that supplemental testosterone can elevate mood in men [15,16], we would expect men on ADT to experience shifts in mood that could alter how they interact with others, such as their partners.

Evidence is accumulating that partners of men on ADT are indirectly affected by this treatment [17–20]. Both the diagnosis (i.e., having one's spouse diagnosed with a potentially life-threatening disease) and the changes in the patients as they deal with their cancer and its treatments can burden their partners [21,22]. Often, partners of male cancer patients report higher levels of emotional distress than the patients themselves [18,23–25]. One might reasonably presume that for prostate cancer patients on ADT, increased side effect severity would result in more relationship difficulties than that experienced by couples where the patient was not on ADT. Indeed, Song *et al.* found that intensity of symptoms from ADT were negatively related to couple's communication; fewer symptoms were linked to better communication [26].

In addition to the possible emotional effects of ADT, patients (both on and off ADT) often experience sexual dysfunction. Sexual dysfunction in the patient has been linked to poor psychological and marital adjustments for both patients and partners [27]. In a longitudinal study of patient-partner pairs, partners reported a negative effect on their sexual relationship at 6 months post-primary treatment, which worsened by 12 months [28]. Problems in sexual function can extend beyond sexual performance and emerge as problems in communication as partners avoid talking about sex-related issues (e.g., [26]). Cognitive and behavioral avoidance after diagnosis with PCa has been linked to higher levels of negative affect in wives of patients [29]. Men with erectile dysfunction have reported avoiding intimate contact with their partners because they fear it might lead to an expectation of more extensive sexual activity that they cannot provide [30,31].

In addition to loss of erection, a man's depressed libido can understandably leave his partner feeling unwanted. A small qualitative study of the female partners of PCa patients not on ADT found that the partners were distressed by the patients not initiating sexual activity [32]. One would expect that to be exacerbated for ADT patients due to their depressed libido, which would likely result in the men initiating less sexually intimate contact.

The increased moodiness of men on ADT can itself hinder communication and negatively impact upon a couple's cohesion. Relationship adjustment has been shown to be predictive of mood state in PCa patients (ignoring treatment modality), such that worse relationship adjustment predicted negative mood [33]. Although that study did not separate men on ADT from men not on ADT, it linked negative mood with poor relationship status for PCa patients.

Sexual bother in PCa patients on ADT has also been shown to be related to both relationship adjustment and depression [34]. These studies all point to the likelihood that patients on ADT would have more difficulties in their relationships than patients not on ADT. An alternative possibility though is that depressing testosterone makes the male patients more emotionally similar to (i.e., concordant with) their female partners (cf. [31]). Recognizing and accepting such emotional concordance, as well as the bonding that may occur in response to dealing with a life-threatening illness, could potentially bring spouses closer together [35].

The primary goal of the present study was to investigate the relationship between dyadic adjustment and ADT treatment, as well as the emotional and sexual factors that predict dyadic adjustment for PCa patients. Much of the previous research examining relational effects of PCa has focused on prostate cancer generally, rather than the impact of different treatment modalities. We anticipate that being on ADT for an extended period of time would have a particularly great impact on couples and that could be influenced by the length of time the couple had been together. We focused specifically on the sexual and relationship changes in PCa patients undergoing ADT compared with patients not on this treatment. We concurrently gathered data from the partners of PCa patients, because there is evidence that partners may be more aware than the patients themselves of the emotional changes the men experience [36]. Also, because PCa treatments can negatively affect the partners of patients and their dyadic bond [18,37,38], we wished to assess the extent to which such changes in dyadic adjustment correlate with emotional changes in the patients.

We had the following hypotheses for this study:

1. Prostate cancer patients on ADT will have different scores on dyadic adjustment than patients not on ADT.
2. Patients and partners of patients on ADT will report worse sexual function and more bother about sexual function than those not on ADT.
3. Patient's negative mood and higher levels of sexual bother will predict worse dyadic adjustment.

Methods

Participants

Participants for this online survey were recruited through PCa-related email listservs (e.g., regional prostate cancer support groups), online support group forums, and through ads posted on Facebook, as well as Facebook groups related to PCa. Participants were not compensated for their participation in the study.

The survey invited participation from both PCa patients (patients) and partners of PCa patients (partners). All invitations to participate provided a brief outline of the topic of the study and included a link to the online survey. Participants were required to have or be in a relationship with someone who had a diagnosis of prostate cancer and whose cancer that had not metastasized. Mood data for this

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sample have been previously reported by Van Dam *et al*. (companion paper to this one, [39]).

Participants were 206 (ADT $n=50$, non-ADT $n=156$) men who had a diagnosis of and been treated for PCa and 66 partners of men with PCa (partners of men on ADT $n=33$, partners of men not on ADT, $n=33$). Participants were asked for their gender with an open-ended response option. All of the patients self-identified as male. Ninety-four percent of the partners were female and 6% were male. There were no differences in demographics between the ADT and non-ADT groups. Patients were considered to be on ADT if they were actively taking LHRH agonists or antagonists, an anti-androgen, or some combination of the two at the time of completing the survey. Participants taking 5-alpha-reductase inhibitors were only included if they were taking it in combination with another androgen-suppressing drug. See Table 1 for complete demographic information. At completion of the survey, both partners and patients were asked to invite their partners to complete the survey, if they had not already done so. They were given a code number so that patient-partner pairs could be linked.

Procedure

All procedures were approved by the Research Ethics Board at Mount Allison University. The survey was run through PsychData (www.psychdata.com). Once participants read and consented to the study, they were presented with a series of questionnaires related to demographic and health information, PCa treatments, mood, relationship function, and sexual function, as detailed in the succeeding text. Patients and partners saw the same questionnaires. For demographics and relationship functioning, partners reported for themselves. For the other questionnaires, they reported on their perceptions of the patient's (i.e., their partner's) experiences. For example, with the mood questionnaires, partners were asked, 'Please indicate how you think your partner has felt, on average, over the past week using the following scale.' At the completion of the survey, all participants were shown a debriefing form with information about the study.

Table 1. Demographic information

	Patients		Partners	
	Non-ADT	**ADT**	**Non-ADT**	**ADT**
N	156	50	33	33
Age (SD)	62 (7.8)	65 (9.1)	57 (9.1)	55 (7.6)
Ethnicity (%)				
White	96.9	88.0	92.8	92.8
Latino/a	1.9	4.0	2.4	3.6
Black/African American	0.6	2.0	0	1.2
Asian		2.0	4.8	2.4
Other		2.0	0	0
Not reported	0.6	2.0	0	0
Sexual orientation (%)				
Heterosexual	88.6	96.0	90.5	92.8
Gay/lesbian	5.8	2.0	7.1	4.8
Bisexual	5.8	2.0	2.4	2.4
Relationship status (%)				
Dating	1.9	0	0	0
Long term	6.4	0	4.8	0
Cohabiting	7.1	8.0	7.1	12.0
Married	84.6	92.0	88.1	88.0
Ever divorced	48.4	41.5	40.5	45.2
Relationship length	27.4 (14.9)	33.26 (15.1)	25.9 (14.2)	24.9 (15.2)

ADT, androgen deprivation therapy; SD, standard deviation.

Measures

The demographics and health questionnaire were created by the researchers and included basic demographic information such as age, sexual orientation, and relationship status. It also asked questions about PCa treatments and side effects of the treatments.

To assess mood, we used the Profile of Mood States-Short Form (POMS), which consists of 37 mood-related words [40]. Participants rate these words using a 5-point Likert scale to indicate how well each word describes their mood on a scale from 1 (not at all) to 5 (extremely) over the past week. Data on results from the six subscales are reported in the companion paper to this article (Van Dam et al. [39]). For the present study, we used the total mood disturbance score, which involves summing the five negative mood subscales (Tension-Anxiety, Depression-Dejection, Anger-Hostility, Fatigue-Inertia, and Confusion-Bewilderment) and subtracting the positive mood subscale (Vigor-Activity). Higher scores on the POMS total mood disturbance indicate higher levels of negative mood.

The Dyadic Adjustment Scale (DAS) was used to assess the nature of couples' relationships [41]. It includes 32 items across four subfactors to measure relationship quality. The consensus subfactor measures the degree to which respondents agree with their partner on various matters. The satisfaction subfactor measures the degree of satisfaction that the respondent feels with their relationship. The cohesion subfactor measures the degree to which the respondent and their partner engage in activities together. The affectional expression subfactor measures the degree to which the respondent agrees with partner regarding emotional and sexual affection. Higher scores on the DAS and its subscales indicate better relationship function.

Lastly, the Expanded PCa Index Composite (EPIC) sexual subscale was used to assess aspects of sex life and sexual function [42]. Part 1 includes questions about the level of sexual function over the past 4 weeks and is scored on a 5-point scale with lower scores indicating worse function (e.g., *How would you rate your level of sexual desire*?). Part 2 includes four questions that ask how much of a problem the participant perceives each aspect of sexual

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dysfunction: level of sexual desire, erectile function, ability to orgasm, and overall sexual function.

Results

Sixty-six partners responded to the survey, although only 12 were partners of patients that also filled in the questionnaire. To ensure these paired samples were not affecting the results, we ran the analyses with and without the patients from the partner–patient pairs. There were no differences in the results. Because results were similar with and without these participants included, the analyses reported in the succeeding text include all participants.

Relationship adjustment

The DAS scale had some missing data because of participants selecting 'skip' for some questions. For participants, who skipped only one or two questions, we filled in the missing data points by pro-rating the data using the participant's other scores for the subfactor of interest, which is a common method used when missing data are random, items are on the same scale, and no more than 20% of the data for one participant are missing. This was not carried out for missing data on the affectional expression subfactor because of its combination of dichotomous and ordinal scales. Participants missing more than two data points on a subscale were excluded from the DAS analysis.

We hypothesized that there would be differences between patients on and off ADT in their scores on the DAS. We entered each of the four subscales as dependent variables into analyses of variance with ADT group as the fixed factor and relationship length as the covariate, because relationship length was correlated with some components of dyadic adjustment. Men on ADT reported higher levels of consensus than men not on ADT, $F(1,203)=4.35$, $p=0.04$, $\eta_p^2=0.02$. Men on ADT also reported significantly higher levels of affectional expression, $F(1,203)=6.87$, $p=0.009$, $\eta_p^2=0.03$ and satisfaction than the non-ADT group, $F(1,214)=7.10$, $p=0.008$, $\eta_p^2=0.03$. Relationship length was not a significant covariate in any of the aforementioned analyses. There was no significant difference between groups on scores for Cohesion, $F(1,224)=0.70$, $p=0.40$, $\eta_p^2=0.003$ (Figure 1(a)). On three of the four subscales, men on ADT reported higher levels of relationship functioning, supporting our hypothesis that there would be a difference between groups.

Partner reports of relationship variables were in the same direction, but there was only a significant difference in affectional expression with partners of patients on ADT reporting higher levels of affectional expression $F(1,62)=4.95$, $p=0.03$, $\eta_p^2=0.07$. There was no significant difference between the ADT and non-ADT groups on reported consensus, $F(1,62)=0.90$, $p=0.35$, $\eta_p^2=0.01$; satisfaction, $F(1,62)=0.77$, $p=0.38$, $\eta_p^2=0.01$; or on Cohesion, $F(1,62)=0.48$, $p=0.49$, $\eta_p^2=0.009$ (Figure 1(b)).

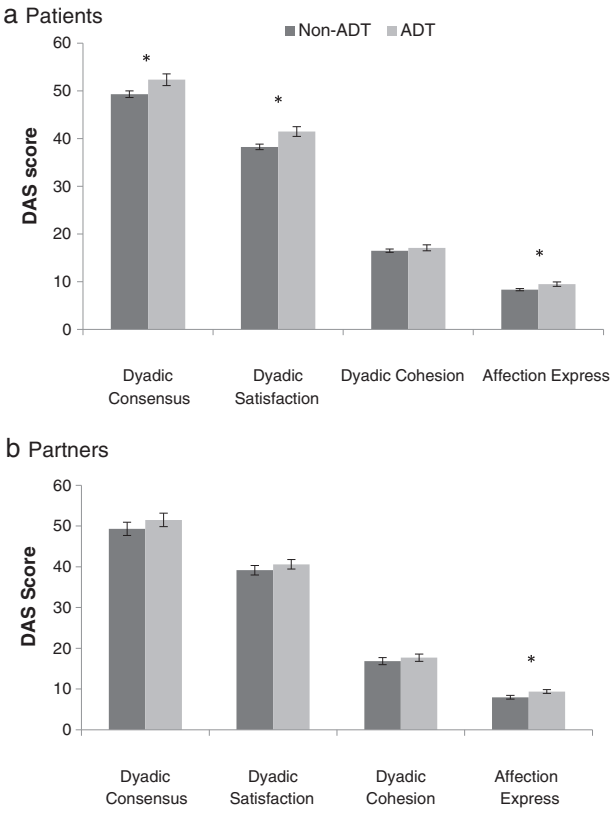

Figure 1. Scores on the dyadic adjustment scale, adjusted for length of the relationship reported by (a) prostate cancer patients and (b) partners of prostate cancer patients. The symbol '*' indicates a significant difference at $p<0.05$. DAS, dyadic adjustment scale; ADT, androgen deprivation therapy

Sexual function

For sexual function, scores on the EPIC sexual function items were entered as independent variables in a multivariate analysis of variance (MANOVA) with ADT status as the independent variable. This was repeated for the sexual bother questionnaires. The overall MANOVA for sexual function was significant, $F(8,190)=8.83$, $p<0.001$, $\eta_p^2=0.26$. We hypothesized that men on ADT would report worse sexual function and more bother than men not on ADT, and this hypothesis was supported. Men currently using ADT reported lower sexual function scores than the non-ADT group for sexual desire, their ability to reach orgasm, morning erections, the amount of sexual activity or sexual intercourse they were having, and their overall sexual function (Table 2). There were no significant differences between the groups on their erection ability or erection frequency, which were low for both groups (all averages were 2 or less, indicating 'poor' or 'very poor' erections). Participants also reported on the degree to which they felt their sexual function issues were a

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Table 2. Differences between non-ADT and ADT patients and partners on sexual functioning variables

		Expanded prostate cancer index composite (sexual subscale)					
		Patients			Partners		
		Non-ADT	ADT	*p*-value	Non-ADT	ADT	*p*-value
Over the past 4 weeks, how would you rate each of the following? Scores range from 1–5 with higher scores indicating better function							
Desire	M (SEM)	3.04 (0.11)	1.53 (0.12)	<0.001	2.83 (0.24)	1.73 (0.23)	0.001
Erection ability	M (SEM)	2.03 (0.09)	1.94 (0.18)	0.60	2.01 (0.19)	1.87 (0.26)	0.69
Orgasm ability	M (SEM)	2.91 (0.11)	2.08 (0.21)	<0.001	3.08 (0.27)	1.94 (0.31)	0.006
Erection frequency	M (SEM)	2.21 (0.11)	1.76 (0.17)	0.04	2.41 (0.32)	2.26 (0.33)	0.74
Nocturnal erections	M (SEM)	1.70 (0.08)	1.3 (0.11)	0.01	2.27 (0.34)	1.97 (0.32)	0.52
Frequency of any sex act	M (SEM)	2.34 (0.08)	1.56 (0.12)	<0.001	2.22 (0.17)	1.84 (0.22)	0.24
Frequency of intercourse	M (SEM)	1.81 (0.08)	1.28 (0.09)	<0.001	2.02 (0.16)	1.55 (0.27)	0.09
Overall sex. function	M (SEM)	2.17 (0.09)	1.73 (0.02)	0.02	3.51 (0.24)	3.02 (0.27)	0.008
Over the past 4 weeks how big of a problem, if any, were the following? Scores range from 0–4 with higher scores indicating higher levels of problems							
Desire	M (SEM)	2.96 (0.11)	3.71 (0.18)	<0.001	2.97 (0.24)	3.10 (0.28)	0.72
Erection ability	M (SEM)	3.94 (0.11)	4.04 (0.18)	0.63	3.69 (0.24)	3.13 (0.3)	0.15
Orgasm ability	M (SEM)	3.06 (0.12)	3.69 (0.2)	0.004	2.94 (0.26)	3.26 (0.32)	0.45
Overall function	M (SEM)	3.71 (0.11)	3.73 (0.18)	0.11	3.50 (0.24)	3.02 (0.27)	0.20

ADT, androgen deprivation therapy; SEM, standard error of mean.
Men on ADT reported significantly lower sexual function in all domains except erection ability. Partners of men on ADT reported lower sexual function of their partner in the domains of desire, orgasm ability, and overall sexual function. Partners and patients reported that patients' sexual function issues were a problem for them.

problem for them. The overall MANOVA was significant, $F(8,190)=4.02$, $p=0.003$, $\eta_p^2=0.08$. Men on ADT reported higher levels of sexual bother than men not on ADT, specifically that their lack of desire and inability to reach orgasm were more of a problem than it was for men not on ADT (Table 2, second question).

Partner results were in a similar direction as the patient results, with partners of men on ADT reporting worse sexual function for the patients than did partners of men not on ADT. The differences were only significant for the partner's level of sexual desire, his ability to reach orgasm, and his overall sexual function. Contrary to our hypothesis, partners of men on ADT did not report that their sexual function issues were more problematic than partners of men not on ADT (Table 2).

Predictors of relationship adjustment

We have previously reported in this sample of participants that patients on ADT experience worse moods (see Van Dam *et al.* [39]), which likely contributes to more relationship difficulties. All of the mood subscales were significantly correlated with relationship status in simple correlation, such that a more negative mood was related to lower relationship satisfaction (*r*s ranged from 0.2–0.6, $p<0.001$). However, as noted earlier, men and partners of men on ADT report slightly better relationship adjustment. To determine the contribution of both the mood variables and the ADT treatment on relationship adjustment, we conducted a simultaneous linear regression that included ADT status (0 = non-ADT, 1 = ADT) and the total mood disturbance scale as predictors of the total DAS score. We hypothesized that worse mood would predict lower levels of dyadic adjustment. For patients, the overall model for the regression was significant, $F(3,194)=33.69$, $p<0.001$, $R^2=0.26$. ADT status was still significantly related to higher DAS scores, but the biggest predictor of DAS scores was the mood disturbance (Table 3a). For partners, the overall model was significant, $F(2,63)=10.81$, $p<0.001$, $R^2=0.24$. Similar to the patients, the partners' assessment of the patients' mood was a larger predictor of dyadic adjustment than ADT status (Table 3a). Results from both patients and partners support the hypothesis that worse mood was related to worse relationship outcomes.

To determine the contribution of sexual bother on relationship adjustment, we conducted a simultaneous linear

Table 3. Predictors of Dyadic Adjustment

	Patients			Partners		
Predictor	***B***	***t***	***p***	***B***	***t***	***p***
a. Being on ADT is a positive predictor of dyadic adjustment, while mood is a negative predictor for both patients and partners						
ADT group (0 = non-ADT)	0.22	2.78	<0.001*	0.26	2.35	0.02*
Total mood disturbance	−0.48	−7.68	<0.001*	−0.47	−4.26	<0.001*
b. ADT status and sexual bother as predictors of dyadic adjustment. Overall sexual function negatively predicted dyadic adjustment for patients, while bother about the partient's level of sexual desire was the largest predictor of dyadic adjustment for partners						
ADT group (0 = non-ADT)	0.16	2.29	0.02*	0.20	1.48	0.15
Desire Bother	−0.03	−0.30	0.77	−0.31	−1.91	0.08
Erection Bother	0.09	0.68	0.05	0.16	0.77	0.43
Orgasm Bother	0.09	0.82	0.41	0.02	0.91	0.73
Overall Sex. Func. Bother	−0.30	−2.41	0.02*	−0.11	−0.51	0.61

ADT, androgen deprivation therapy.
Dependent variable: dyadic adjustment scale total score.
*Indicates a significant effect at $p<0.05$.

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regression that included ADT status (0 = non-ADT, 1 = ADT), and the four sexual bother items from the EPIC as predictors of the total DAS score. We predicted that higher levels of sexual bother would be related to worse relationship adjustment. For patients, the overall model for the regression was significant, $F(5,200) = 8.15$, $p < 0.001$, $R^2 = 0.33$. ADT status was still significantly related to higher DAS scores, but the biggest predictor of DAS scores was the amount of bother related to the patient's overall sexual function. Bother related to desire, erectile function, and orgasm were not related to DAS scores (Table 3b). For partners, the overall model was not quite significant, $F(5,60) = 2.02$, $p = 0.09$, $R^2 = 0.10$. For partners, the predictor that came closest to significance and had the largest predictive value was the degree of bother related to the partner's level of sexual desire, which was negatively related to DAS scores (Table 3b). Although not all components of sexual bother were significant predictors of DAS scores, the significant variables do support our hypothesis that worse sexual bother scores, as perceived by both patients and the partners of patients, predict poorer dyadic adjustment.

Conclusions

Side effects from PCa treatments affect the emotional, sexual, and relationship experiences of both prostate cancer patients and the partners of patients. We assessed these variables by having PCa patients as well as partners of patients with PCa report on dyadic adjustment, sexual function and sexual bother, and mood. We found that, while participants on ADT and partners of men on ADT reported slightly better dyadic adjustment, their sexual dysfunction was more severe. These findings echo those of Benedict *et al*. who found that higher levels of sexual bother was related to greater relationship cohesion and satisfaction in ADT patients [34]. However, when testing the direct relationship between sexual bother and dyadic adjustment, contrary to Benedict *et al*., the results of this study showed that both negative mood and higher levels of sexual bother were related to worse relationship outcomes. The negative effects of both poor mood and sexual bother on dyadic adjustment elucidate the psychosocial burden that can come from PCa treatments. This burden can either bring patients closer to their partners or push them away. As pointed out by others (e.g., [13]), PCa patients on ADT in particular need to be screened for distress and, when identified, provided medical and/or psychological support.

We were particularly interested in obtaining the perspectives of both patients and partners of patients on this problem. One of the most striking findings was the similarity in the patterns of response of the men and the partners, especially given that they were not all partner-patient pairs. This similarity in our results between both patients and partners of patients indicates that the observed pattern of changes in men as a result of ADT is likely common for many men on ADT.

We did not make a directional hypothesis about the effects of ADT on relationship function because, as outlined in the Introduction, we imagined that it could either enhance or erode intimacy. On the one hand, a change in a patient's mood that he tries to hide or deny may erode intimacy. On the other hand, lowered androgen titers can, in certain ways, make men more endocrinologically similar to and emotionally congruent with their partners. In the first case, being tearful may make patient feel emasculated and failing within a masculine gender role [24], which he feels he must hide to preserve masculine self-esteem. At the other extreme, a patient and his partner may elect to see his emotional changes, although perhaps feminizing, as a way to feel more connected as their emotional responsiveness converge. This convergence could thus build intimacy. Both extremes, as displays of increased emotionality, have been noted elsewhere as in patients' responses to ADT [31]. An independent study with hypogonadal males, who were not cancer patients, compared with healthy controls supports this personality convergence between men and women when the men are androgen-deprived [43]. In that study, androgen deprivation was associated with increased agreeability in the big five personality test and, significantly so, if the men were on supplemental estrogen compounds.

In addition, the experience of going through PCa together could potentially bring couples closer [35]. We found that being on ADT was significantly related to better relationship functioning for patients compared with those not on ADT, and this was true for both patients and partners. As a follow-up, to understand these data, we looked at the congruence in mood data from the 12 patient-partner pairs that we had (five on ADT and seven non-ADT). The correlations between mood variables were higher for all of the POMS subscales for the patient–partner pairs who were on ADT, indicating greater congruence in these couples. The sample size was too small to say anything reliable about the differences between men on and off ADT, but they give us some insights for future studies. However, there may be a bias in the characteristics of couples where both patient and partners were willing to take our survey. An unusually high congruence in those couples would be consistent with both partners willing to participate in the study. Previous studies have indicated that congruence between couples about issues related to PCa is important for positive outcomes [29,44].

For the sexual function data, the men on ADT reported more severe sexual problems. Men on ADT reported that their lack of sexual desire was more of a burden than did men not on ADT (who also had fewer problems with desire). Men on ADT also felt their inability to orgasm was more problematic than men not on ADT, although both groups reported similar low levels of orgasm capability. Partners of PCa patients, both on and off ADT, scored

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high on the degree to which their partners' (i.e., the patients) sexual function was a problem for them (the partners), and there were no differences between the groups. This is further evidence that ADT's effects on men also have a negative effect on their partners. One might imagine that a lack of erectile function may be less of a bother for men on ADT because their desire is also lowered, but our data indicate that the lack of desire in and of itself remains a problem for both men on ADT and their partners.

We were also interested in the factors that were related to relationship adjustment for both patients and partners. Negative mood in patients (and when perceived as such by their partners) was the biggest predictor of worse dyadic adjustment for both patients and partners. Although being on ADT was related to slightly better dyadic adjustment, our previous study shows ADT is also related to worse moods (Van Dam *et al*. [39]). The effect of ADT on relationships is likely dependent on how the couple adjusts to these emotional changes, that is, their willingness to acknowledge and accept them.

When we looked at the role of sexual function on relationship adjustment, there was an interesting difference. For patients, the more they felt their overall sexual function was a problem, the lower they scored on relationship satisfaction. For partners, however, it was the patient's low desire that most impinged upon their relationship satisfaction. So, for men, the inability to have sex the way they used to was their biggest problem, while for their partners, the loss of the male's desire for them and affection toward them was what they struggled with the most.

Although this study provided important information about the dyadic relationships of PCa patients and partners, the study was not without its limitations. As with any study recruiting from support groups and websites, our patient sample may differ from patients not active in support groups or websites. Participants may have been more in need of support, more Internet savvy, or more motivated to be informed about their diagnosis than PCa patients sampled more broadly. Our participants also had relatively high socioeconomic status and were predominantly white. This is problematic given that black men in North America are at higher risk for PCa, and this was a demographic we did not capture. We also had difficulty in recruiting partners of patients, which is common, as noted recently by Dagan and Hagedoorn [45]. The small sample size for partners may be an issue for power in this sample. Furthermore, the partners we did recruit may be biased toward ones with heightened concern about their partners and spending exceptional amounts of time on the Internet searching for information on treatments. They may also be having a more difficult time with the way that PCa has affected their partners directly and their own lives indirectly and were seeking online support for themselves. Our sample of men on ADT was also relatively small compared with the sample of men not on ADT, so it may not be representative of the experiences of all men on ADT.

Lastly, it is likely that we have some bias in the sample of men in our study who were not on ADT in that they reported poor erectile function similar to the men on ADT. Although erectile dysfunction is common with PCa treatments, those who were particularly bothered by it may be more likely to have been online looking for solutions to their problem and, coincidentally, more likely to have found their way to our survey.

Implications

The changes in mood and sexual function provoked by ADT can affect a couple's dyadic relationship, although not necessarily in a simple or consistent fashion. ADT does not always damage a dyad. Where a couple appears to have good dyadic adjustment (i.e., high cohesion) when the patient is on ADT, consensus, as one measurable component of dyadic adjustment, is high. Our data suggest that one potentially important area for consensus is on how both the patient and his partner perceive ADT's effect on his mood. If the patient and partner agree on how hormone therapy is affecting him, that is, if they agree on the emotional impact of ADT, this can help build cohesion. However, the extent to which he is distressed by loss of sexual function and she is distressed by loss of affection can erode cohesion.

In terms of the impact of PCa treatments' on sexual function, loss of libido from ADT does not eliminate distress from loss of erections from other treatments, particularly for younger men who were presumably sexually active at the time they were treated (Van Dam *et al*., [39]).

Our study has implications to clinical practice. First, physicians should assess whether patients are sexually active when starting them on ADT. As an issue of informed consent, patients should be made aware of the potentially negative psychological impact of ADT, particularly if they are young and sexually active. Second, because ADT affects both patients and partners, prescribing physicians have an ethical responsibility to inform not just the patient but also his partner about how ADT might affect the patient emotionally. Last, in assessing the quality of life of patients on ADT, healthcare providers need to listen to both the patients and the partners. The partners' observations of the impact of ADT on the patients are potential as valid and clinically relevant as the patients' own perception of how the treatment is affecting his mood and quality of life.

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