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ORIGINAL ARTICLE

Longitudinal dyadic associations of fear of cancer recurrence and the impact of treatment in prostate cancer patients and their spouses

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ABSTRACT

Background: Fear of cancer recurrence (FCR) in patients and their spouses is associated with reduced quality of life, but little is known about longitudinal dyadic associations of FCR between them. This study examined (i) the trajectory of FCR from pre-treatment to 12 months later; (ii) dyadic associations of FCR over time; and (iii) whether cancer treatment type predicted later FCR among prostate cancer patients and their spouses.

Methods: Sixty-nine patients and 71 spouses of patients with localized prostate cancer completed a FCR measure at baseline (pre-treatment), 6 months and 12 months later (post-treatment). A repeated measures linear mixed model was used to examine FCR trajectories. Actor-partner interdependence models (APIMs) were conducted on the 52 couples with complete data to examine actor and partner effects and treatment type on subsequent FCR.

Results: Patients and spouses reported moderate FCR levels over time, though spouses' FCR was significantly higher than patients' FCR ($p < .001$). FCR declined significantly for both groups over time ($p < .001$). APIMs demonstrated significant actor effects in baseline to 6 month, and 6–12 month models. Surgery was significantly associated with lower spouse FCR at 6 months, and radiation with lower patient FCR at 12 months.

Conclusions: This is the first study to have concurrently examined FCR longitudinally in prostate cancer patients and spouses. Patients' and spouses' FCR declined from pre- to post-treatment, with spouses experiencing greater FCR than patients over time. FCR in patients and spouses did not appear to impact one another over time. Treatment type impacted FCR in patients and spouses differently.

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Introduction

Prostate cancer is the second most frequently diagnosed cancer in men in the world [1]. Although survival rates are high, prostate cancer patients face long-term monitoring of prostate-specific antigen levels as a way of detecting potential cancer recurrence after primary treatment has been completed [1]. Hence, it is not surprising that fear of cancer recurrence (FCR) is a significant issue for them [2–6]. Furthermore, FCR is an important characteristic to examine due to its prevalence [6] and consistent association with poorer quality of life and distress [2–4,6,7].

In a study of 283 prostate cancer patients who were a median of 7.1 years post-surgery [6], about a third of all patients experienced high FCR. Longitudinal studies have also described the trajectory of FCR over time. In a study of 519 prostate cancer patients with localized disease who were assessed from pre-treatment to up to 2 years post-treatment, there was a significant decline in FCR after treatment, but no substantial change in the 2 years thereafter [7]. In addition, a longitudinal study of 962 cancer patients (27% of whom were prostate cancer patients) from the peri-operative period to 18 months later found that FCR was the highest at baseline, decreased significantly 2 months later, and then remained stable to 18 months later [8].

Moreover, the detrimental effects of FCR on quality of life have been demonstrated across numerous studies [2–4,6,7]. In one study, FCR was found to be a significant problem among prostate cancer patients; high levels of FCR were associated with lower quality of life, more physical problems, higher distress, and more post-traumatic stress symptoms [6].

FCR, however, is not just a concern for cancer patients. Partners of patients may also be affected by concerns about recurrence. In a recent study, FCR was found to be a significant concern for the partners of prostate cancer patients as well; high FCR in these partners was also found to be associated with impairments to their quality of life, supporting the

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notion that family members of cancer patients also face significant challenges [9].

Studies that have examined FCR in patients and partners across different cancer types often show that partner FCR is generally similar to patient's FCR level [6,9,10], and also that partner FCR may be associated with, and possibly influence, patient outcomes [11,12]. In studies of prostate cancer patients and their partners, FCR severity and the frequency of those endorsing high levels of FCR are similar between prostate cancer patients and their partners [6,9]. However, such studies have been cross-sectional in nature and focused on prostate cancer patients up to 19 years post-surgery rather than patients undergoing treatment. As of yet, no studies have identified trajectories of FCR in prostate cancer patients *and* partners concurrently over time from immediately prior to treatment to the months following treatment. Furthermore, to the best of our knowledge, no studies have investigated dyadic associations of FCR in prostate cancer patients and partners longitudinally.

In addition, due to known associations between FCR and different treatment approaches [13,14], it is of interest to investigate how different treatments may impact the trajectory of FCR in patients and their spouses. In a study of prostate cancer patients, having undergone more invasive treatment such as radical prostatectomy (i.e., surgery) was significantly correlated with lower FCR than having undergone less invasive treatment such as androgen deprivation therapy [15]. A caregiver study found a similar effect; when head and neck cancer patients received major surgery as their primary treatment, caregivers experienced lower levels of FCR than when patients underwent less extensive surgeries [16]. Less is known about the possible effect of treatment modality on levels of FCR in spouses of prostate cancer patients.

The present study was informed by two complementary frameworks. The first framework, social-cognitive theory, considers bidirectional influences between individual-level factors, environment and behavior. In other words, patients and spouses can be seen as part of a shared physical and social environment, in which, through observation of each other's experiences, can learn from and affect one another. Hence, this theory requires an examination of both actor effects (on him/herself) and partner effects [17]. The second framework, the common sense model of self-regulation, describes the dynamic process through which an individual forms illness representations (such as the treatability of health threats) and describes their affective and behavioral responses to those representations [18]. Hence, our aims were to (1) describe the trajectory of FCR from pre-treatment to 12 months post-treatment in prostate cancer patients and in their spouses; (2) measure dyadic associations of FCR in patients and spouses over time; and (3) evaluate the type of cancer treatment received as a predictor of later FCR in both patients and spouses.

Methods

Participants and procedures

Data for this study come from a large-scale longitudinal study that examined treatment decision making and quality of life among patients diagnosed with localized prostate cancer [19]. Included participants for these secondary analyses were recruited between April 2001 and November 2002 from Fox Chase Cancer Center. All study procedures were approved by the Fox Chase Cancer Center Internal Review Board. Participants were men diagnosed with early-stage, localized prostate cancer who presented for a second opinion about treatment options, free of substantial comorbidity, fluent in English, and married. Spouses who were fluent in English were also eligible to participate. All participants underwent an informed consent process and provided written consent to the inclusion of material pertaining to themselves, and acknowledged that they would not be identified via any publication arising from their participation and would be fully anonymized. Patients and spouses were assessed at baseline (i.e., prior to making a treatment decision), 6 months after baseline, and 12 months after baseline. Participants received $10 for each questionnaire that they returned.

Measures

Sociodemographic and medical information

Sociodemographic information for both partners included self-reported age, race/ethnicity, time together in years, employment status, and educational level. Medical variables for prostate cancer patients were extracted from medical charts, i.e., type of treatment received, days since diagnosis, prostate-specific antigen levels, and Gleason scores.

Fear of cancer recurrence

Two self-report questions were used to measure FCR: (1) 'how worried are you about a recurrence of your/your partner's prostate cancer?' and (2) 'how worried are you that your/your partner's prostate cancer has spread?' The questions were adapted from a cancer specific worry measure used in breast cancer research [20]. Responses were made on a 5-point Likert scale (1 = not at all, 2 = a little bit, 3 = somewhat, 4 = quite a bit, and 5 = very much.) The mean of the two responses was calculated and higher scores indicated greater FCR. Cronbach's α for patients in the study were .85, .79, and .78 for baseline, 6 month, and 12 month time points, respectively, and .77, .85, and .90, respectively, for spouses indicating acceptable to excellent internal consistency.

Statistical analyses

Analyses were conducted to describe the trajectory of FCR over time and examine the degree of similarity in FCR between patient-spouse dyads at each time point from pre-treatment to 12 months later. The change in FCR over time was evaluated with a repeated measures linear mixed model (V.9.4 of SAS procedure MIXED). A dummy-coded group variable (patient versus spouse) was entered as the independent variable to test main effects and a time by group variable to test for any interaction effect. The magnitude of patient and

spouse FCR was compared between patient and spouse groups at each time point with independent Tukey-adjusted post-hoc tests.

The influence of partner FCR over time in patient-spouse dyads was also examined, and the potential moderating effect of treatment type upon FCR. To evaluate the dyadic effects of patient fears on spouses and vice versa, actor-partner interdependence models (APIMs) were conducted using structural equation modeling (SEM) in SPSS AMOS 24 using the dyad as the unit of analysis. The APIM is a model of dyadic relationships that 'integrates a conceptual view of interdependence in two-person relationships with the appropriate statistical techniques for measuring and testing it' [21, p.101]. Four APIMs were examined. The first set evaluated dyadic relationships from baseline to 6 months later with one model evaluating the receipt of surgery as an independent predictor of later FCR and a second model evaluating the receipt of radiation as an independent predictor of later FCR. The second set evaluated dyadic relationships from the 6 month to the 12 month assessment time point looking at surgery receipt or radiation receipt as independent predictors of later FCR. Initial FCR for patients, initial FCR for spouses, and treatment received were all exogenous (independent) variables, and subsequent patient FCR and subsequent spouse FCR were endogenous (dependent) variables. Measurement errors for initial FCR for patients and spouses, and for subsequent FCR for patients and spouses, were set to correlate with each other. A total of 52 patient-spouse dyads with complete data for both members of the dyad were examined. These analyses allowed for the simultaneous estimation of *actor effects*, within person change in FCR over time, while also estimating *partner effects*, the effect of one member of the dyad's initial FCR on the other member's later FCR, controlling for their own initial FCR. Model fit was determined by the goodness of fit index (GFI) values of >0.90, confirmatory fit index (CFI) values >0.95, and root mean squared error of approximation (RMSEA) values <0.06 indicating adequate fit of each model to the data.

Results

Participant characteristics

A total of 69 patients and 62 spouses (out of 71 dyads enrolled) completed the FCR measure (see Table 1). Participation and attrition rates for the parent study that focused on patient recruitment have been described elsewhere with the authors noting that Caucasians, married patients, and retired patients were significantly more likely to stay in the study [19]. It was not possible to compare spouse participants with spouse non-participants or spouse drop-outs on basic sociodemographic data as that data was not collected. Primary reasons for drop outs were lack of interest, lack of time, or not responding to contact by the research team. Patients were on average 3 months (89.8 d) post-diagnosis at baseline, with the majority going on to receive primary treatments that included radiation (58%), followed by surgery (28%) and brachytherapy (14%). Patients were significantly older than spouses ($t[126] = -2.74$, $p < .001$), and marginally more likely than spouses to have completed college ($\chi^2 = 4.03$, $p = .05$). All spouses identified as female. Patients and spouses did not differ on race/ethnicity or employment status.

Table 1. Participant characteristics.

	Patients ($n = 69$)				Spouses ($n = 62$)[a]			
	Mean	SD	*n*	%	Mean	SD	*n*	%
Demographic information								
Age	64.5	8.1			64.3	8.4		
Time together, years	34.7	13.7			–	–		
Education level								
Grade school			6	8.7			6	9.7
High school			26	37.7			22	35.5
College graduate			22	31.9			19	30.6
Post graduate			15	21.7			13	21.0
Missing			0	0			2	3.2
Employment status								
Employed			30	43.5			24	38.7
Retired			34	49.3			31	50.0
Unemployed or other			5	7.2			5	8.0
Missing			0	0			2	3.2
Race/ethnicity								
Caucasian			63	91.3			55	88.7
African-American			5	7.3			4	6.5
Hispanic			1	1.4			1	1.6
Unknown			0	0			2	3.2
Clinical information								
Days since diagnosis[b]	89.8	95.0						
PSA[c]	7.5	7.4						
Gleason score[d]	5.7	2.4						
Primary treatment								
Radiation			36	52.2				
Surgery			18	26.1				
Brachytherapy			7	10.1				
Radiation and brachytherapy			3	4.3				
Surgery and radiation			1	1.4				
Watchful waiting			1	1.4				
Missing			3	4.3				

[a]Two spouses enrolled in the study without their partners; data regarding treatment received by their partners were missing. These numbers reflect the 62 participants out of the 71 spouses who enrolled in the study who completed the fear of cancer recurrence questionnaire.
[b]Fifteen patients had missing diagnosis dates.
[c]Three patients had missing PSA levels.
[d]Seven patients had missing Gleason scores.

Within-couple correlations of FCR

Intraclass correlations (ICCs) were used to calculate within-couple correlations of FCR scores at each time point. Highest ICCs were observed at Baseline (ICC = .34, $p = .004$) and 6 months (ICC = .26, $p = .02$), but was non-significant at 12 months (ICC = .08, $p = .28$).

Trajectory of FCR

Patients and spouses reported moderate levels of FCR across all three time points (Figure 1 and Table 2). The repeated measures linear mixed model indicated that there was a significant main effect for time ($F[2, 248] = 59.83$; $p < .001$) where FCR declined significantly over time. There was also a significant main effect for partner type ($F[1, 129] = 14.63$; $p < .001$) indicating that spouses, overall, reported significantly higher FCR than patients over time. However, there was no significant group × time interaction, indicating that patients and spouses had similar rates of decline in FCR over

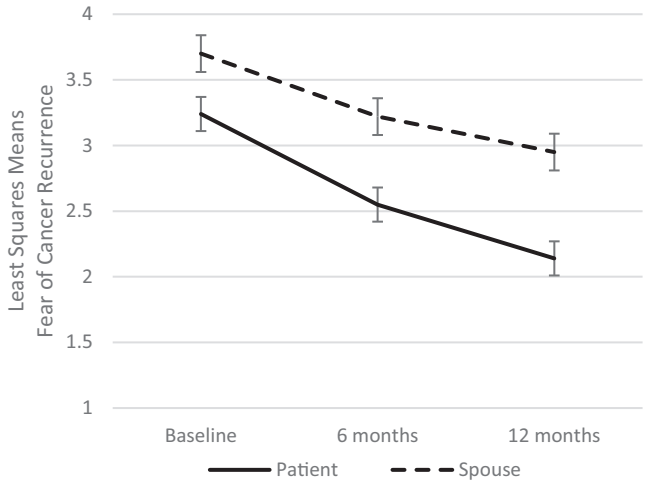

Figure 1. Least squares means for fear of cancer recurrence over time in patients and spouses with standard error bars.

Table 2. Fear of cancer recurrence parameter estimates and standard errors for patients and spouses over time.

Fixed effects	Estimate[a]	Standard error	CI
Baseline	3.47	0.10	3.28, 3.66
6 month time point	2.88	0.10	2.69, 3.07
12 month time point	2.55	0.10	2.35, 2.74
Patient	2.64	0.12	2.42, 2.82
Spouse	3.29	0.12	3.05, 3.53
Patient × baseline	3.24	0.14	2.98, 3.51
Patient × 6 month time point	2.55	0.13	2.29, 2.81
Patient × 12 month time point	2.14	0.14	1.88, 2.41
Spouse × baseline	3.70	0.14	3.42, 3.97
Spouse × 6 month time point	3.22	0.14	2.94, 3.49
Spouse × 12 month time point	2.95	0.14	2.68, 3.23

CI: confidence interval.
[a]All estimates are significantly different from 0.

time. Post-hoc tests of differences between groups using Tukey–Kramer adjustments indicated that FCR did not significantly differ between groups at baseline ($t[248] = -2.33$; $p = .19$), but were significantly different at the 6 month ($t[248] = -3.43$; $p < .001$) and 12 month time points ($t[248] = -4.14$; $p < .001$).

Pre-treatment to 6 months post-treatment

For both patients and spouses, there were significant actor effects from pre-treatment to 6 months post-treatment (Table 3). The magnitude of FCR was relatively stable within each person over time. There were no significant partner effects, meaning that the pre-treatment FCR of one member of the dyad was unrelated to the post-treatment FCR of the other. There was no impact of receiving surgery on later FCR for patients. However, there was a significant effect of receipt of surgery (as opposed to other primary treatments) on post-treatment FCR reported by spouses; when patients had completed surgery, their spouses reported lower FCR at 6 months (Figure 2). Similar analyses were examined with a dichotomous variable for radiation. There was no effect of receipt of radiation on either patient or spouse FCR at 6 months (Figure 2).

6 Months post-treatment to 12 months post-treatment

For both patients and spouses, significant actor effects were found over the course of the post-treatment follow-up for FCR at 6 and 12 months later (see Table 3). Again, this reveals how stable the magnitude of FCR is for both patients and spouses during the first year after prostate cancer treatment completion. There was a trend for a partner effect for spousal FCR at 6 months to predict patient FCR at 12 months, but no other partner effects were observed. Surgery and radiation were evaluated as possible independent predictors. There was no effect of surgery on FCR for either patients or partners. There was a significant effect of radiation on patient FCR at 12 months (Figure 3).

Discussion

This study corroborates the findings of numerous other studies that indicate that FCR occurs in both cancer patients and their spouses [6,9,10,16,22]. Our results indicate that on average, patients and their spouses reported moderate levels of FCR at all time points from pre- to post-treatment. Our findings also expand on existing cross-sectional research in prostate cancer patients and spouses by examining the trajectory of their FCR over time from before primary treatment to 12 months later. There was a steady and significant decline in FCR over time in both patients and spouses. A similar significant reduction in FCR over time was found in another prostate cancer study that followed 730 patients with localized disease from pre-treatment to 12 months post-treatment [4]. Studies in other cancer populations have found declines in FCR from pre- to post-treatment, but then stabilization after the acute period. For example, a study of allogeneic hematopoietic stem cell transplant patients pre-transplant to 12 months post-transplant showed a significant decline from pre-treatment to 100 days post-transplant and to 12 months post-transplant, but not between 100 days and 12 months post-transplant, suggesting a stabilization of FCR post-treatment [23]. A large study of 962 cancer patients also reported a significant decline from the peri-operative period to 2 months later, but then stable FCR for the period up to 18 months later. Still, other studies have reported stable FCR over time in breast cancer patients [24] and head and neck cancer patients and their carers [22].

We did not see clear partner effects in our results. Although there was significant within couple agreement of FCR at Baseline and 6 months later, the APIMs that captured dyadic effects over time indicated only a trend toward spouse FCR at 6 months being associated with patient FCR at 12 months. In other words, this effect was neither significant nor apparent across partners across any other time period. The more important observation is that there was a steady decline in FCR observed in both patients and spouses over time suggesting that the experience of prostate cancer treatment may help to ameliorate the pre-treatment fears related to cancer recurrence and progression with a continued reduction in fears even beyond the acute period. This may occur because active primary treatments, at least in the

Table 3. Actor–partner interdependence models (APIMs).

	FCR at 6 month time point								
	Patient[a]			Spouse[a]					
Predictors	B	β	CI	B	β	CI	*GFI*	*CFI*	*RMSEA*
Model 1							0.967	0.965	0.157
Patient baseline FCR	0.77	0.68***	0.48, 1.06	0.10	0.09	−0.15, 0.41			
Spouse baseline FCR	−0.09	−0.09	−0.34, 0.22	0.68	0.65***	0.43, 0.91			
Surgery[b]	−0.13	−0.05	−0.81, 0.86	−0.59	−0.25**	−1.11, 0.11			
Model 2							0.983	0.995	0.056
Patient baseline FCR	0.78	0.69***	0.51, 1.07	0.08	0.08	−0.18, 0.34			
Spouse baseline FCR	−0.12	−0.11	−0.34, 0.16	0.61	0.62***	0.40, 0.85			
Radiation[c]	0.21	−0.09	−0.37, 0.71	0.21	0.10	−0.29, 0.73			
	FCR at 12 month time point								
Model 3							0.990	1.000	0.000
Patient 6 month FCR	0.60	0.64***	0.39, 0.79	−0.12	−0.10	−0.36, 0.11			
Spouse 6 month FCR	0.15	0.15	−0.09, 0.41	0.88	0.74***	0.60, 1.11			
Surgery[b]	0.21	0.09	−0.40, 0.78	−0.06	−0.02	−0.65, 0.49			
Model 4							0.980	0.991	0.079
Patient 6 month FCR	0.59	0.62	0.39, 0.78	−0.12	−0.10	−0.35, 0.10			
Spouse 6 month FCR	0.18	0.18†	−0.07, 0.44	0.84	0.73***	0.54, 1.10			
Radiation[c]	−0.44	−0.21*	−1.02, 0.05	0.34	0.14	−0.21, 0.84			

FCR: fear of cancer recurrence mean score; B: unstandardized coefficient; β: standardized coefficient; CI: confidence interval.
†$p < .10$,
*$p < .05$,
**$p < .01$,
***$p < .001$.
[a]$n = 52$ dyads.
[b]Surgery: 0 for no surgery, 1 for completed surgery.
[c]Radiation: 0 for no radiation, 1 for completed radiation.

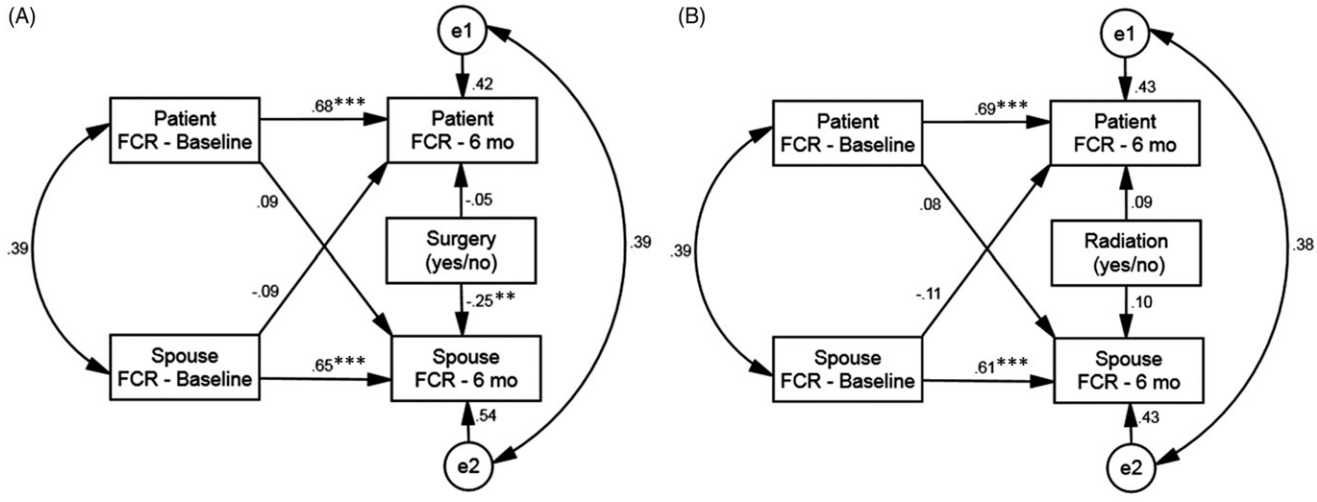

Figure 2. Associations between fear of cancer recurrence from baseline to 6 months and (A) receipt of surgery at the dyadic level, and (B) receipt of radiation therapy at the dyadic level. All coefficients are standardized. FCR: fear of cancer recurrence; *$p < .05$, **$p < .01$, ***$p < .001$.

case of localized prostate cancers, are generally deemed 'curative'. Furthermore, the passage of time without a recurrence may be reassuring to patients and their spouses by indicating that the cancer is less likely to come back. Indeed, findings from the large scale Prostate Cancer Outcomes Study that examined 2365 men with clinically localized prostate cancer over 24 months corroborate these possibilities [25]. Results from that study indicated that men who received active treatment were more satisfied with their treatment selection than men who did not. Moreover, perceiving themselves to be cancer free was significantly associated with treatment satisfaction.

We were also able to establish that patients' and spouses' FCR significantly differed. Spouses consistently reported greater FCR than patients. Although these findings are similar to those of a study in head and neck cancer patients and their caregivers [22], they do differ from the majority of studies in the field. In a recent review article that examined literature focused on FCR research across all cancer types, the authors determined that there was generally no significant difference in FCR between patients and their partners [10]. Moreover, in a recent study that specifically focused on prostate cancer patients and their spouses, no significant differences in FCR in cancer patients and spouses were found [6,9]. However, it is important to note that their examination of FCR was cross-sectional in design and focused on prostate cancer patients who were 0.8–19 years post-surgery. Our findings present a different picture of the nature of FCR in

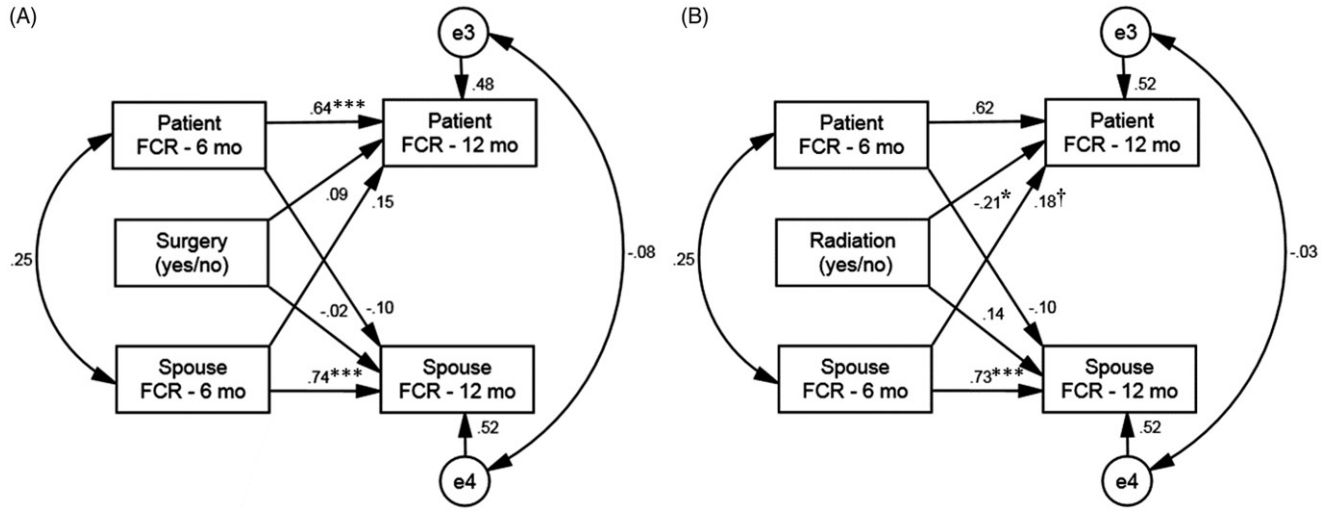

Figure 3. Associations between fear of cancer recurrence from 6 months to 12 months and (A) receipt of surgery at the dyadic level, and (B) receipt of radiation therapy at the dyadic level. All coefficients are standardized. FCR: fear of cancer recurrence; †$p < .10$, *$p < .05$, **$p < .01$, ***$p < .001$.

patients and spouses suggesting that patients may actually experience less FCR during the treatment period and in the months after treatment than their spouses do, perhaps because the process of actively undergoing treatment may ameliorate FCR for patients more than it does for their spouses who can only experience the treatment vicariously. It is possible that gender plays a role in these findings as all spouses were female and patients were male. However, FCR research has generally been equivocal regarding the role of gender in FCR. For example, in Mellon et al.'s population-based study of cancer patients and their caregivers [12], they found that caregivers generally had significantly more FCR than patients, but they did not detect any specific gender effects. More research is needed to determine whether there remains a distinct difference in patient and spouse FCR over time or whether they begin to converge.

Importantly, our results also suggest unique effects associated with the type of cancer treatment received by patients. Surgery, the more invasive treatment option, ameliorated fear in spouses, at least from pre-treatment to 6 months later, but not from the 6 month to 12 month time points. This is partially consistent with the literature that has suggested that patients and spouses may deem more extensive/invasive treatments as more likely to assuage fears [15,16]. In contrast, results indicated that receiving radiation therapy was associated with lower FCR in patients from 6 months to 12 months. These findings are less consistent with the literature. However, due to the known relationship between physical symptoms and FCR [6], it is possible that radiation patients' experiences of symptoms and their illness may differ from the experiences of patients who have undergone other treatments, potentially influencing their FCR differently. This is an area that would require further investigation in future research.

This study is not without its limitations. First, the study's sample size was smaller than other investigations of FCR in prostate cancer patients, potentially limiting its generalizability. Second, although patients were at the same disease stage at baseline, this study was not powered to examine associations with disease characteristics over time that may have influenced FCR. However, it should be noted that in a large national cohort of prostate cancer patients following treatment whose disease characteristics were examined [5,7], only positive surgical margins were found to be associated with FCR [5]. Third, we undertook mean-level analyses of FCR over time which may have prevented us from examining unique inter-individual heterogeneity. Fourth, there are no clinical cut-offs for the items we used to measure FCR so were unable to determine the severity of FCR across the samples. Finally, the FCR measure used was an adaptation of a cancer worry measure used in breast cancer patients and had not been validated in prostate cancer populations. Future research would benefit from a dyadic longitudinal investigation of FCR using a more psychometrically rigorous measure.

In conclusion, the results from this study add to extant literature by providing important information about the trajectories of and relationships between FCR in prostate cancer patients and spouses from pre-treatment to 12 months later. The analyses enabled us to not only determine that FCR tends to decrease over time in patients and spouses, but also that FCR in patients tends not to be longitudinally associated with FCR in spouses and vice versa. Importantly, the findings suggested that treatment type likely plays an important role in determining later FCR for both patients and spouses in different ways. Our findings have important implications for patients, their spouses, and health care providers. Knowledge about these different trajectories and contributing factors has the potential to improve efforts toward the development of targeted interventions to ameliorate FCR in patients and their spouses. Knowing that fears are more likely to be greater early on and, to a greater extent in spouses over time, establishes the importance of providing psychosocial support to both members of the dyad post-diagnosis. In addition, knowing that certain treatments may trigger comparatively greater fear in either partner at different stages of the cancer trajectory can provide important

information to health care providers about how to enhance the specificity of interventions to treat FCR when working with couples.

Disclosure statement

The authors report no conflicts of interest. Content is solely the responsibility of the authors and does not necessarily represent the official view of the National Institutes of Health.

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