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Enhancing Survivorship Care Planning for Patients with Localized Prostate Cancer Using a Couple-focused Web-based, mHealth Program: The Results of A Pilot Feasibility Study

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Abstract

Purpose: To examine the feasibility of an Enhanced Survivorship Care Plan (ESCP), that integrated the web-based program Patient Education Resources for Couples (PERC) - into a standardized Survivorship Care Plan (SCP), and estimated the outcomes of ESCPs versus SCPs.

Methods: In this randomized pilot trial, localized prostate cancer (PC) patients and partners (i.e., couple) were randomly assigned to ESCP that contained a link to PERC or to SCP that contained a link to general PC information on the National Cancer Institute website. Couples completed assessments measuring quality of life (QOL), appraisal of symptoms, and coping resources at baseline (T1) and 4–6 months later (T2). We examined feasibility (e.g., recruitment and retention)

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Implications for Cancer Survivors. SCPs, enhanced using a web-based intervention (e.g., PERC), may help PC cancer survivors better manage their urinary symptoms.

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Conflict of Interest: Authors declare no conflict of interest.

Ethical approval: All procedures performed in this study were in accordance with the ethical standards of the institutional and/or national research committee and with the 1964 Helsinki declaration and its later amendments or comparable ethical standards. IRB #: 16–1913 (University of North Carolina-Chapel Hill).

Informed consent: Informed consent was obtained from all individual participants included in the study.

using descriptive statistics. Linear mixed models examined changes in couples' outcomes over time and Poisson regression examined differences in patient healthcare utilization.

Results: Sixty-two couples completed T1 surveys (recruitment rate 41.6%) and were randomly assigned to receive ESCP (n=31) or SCP (n=31). Twenty-eight (ESCP) and 25 (SCP) couples completed T2 surveys (retention rates=90.3% vs 80.7%). ESCP participants (70%) reviewed webpages consistent with patients' symptoms. ESCP patients reported greater program satisfaction ($p=0.02$) and better urinary symptom scores ($p<0.01$) than SCP patients.

Conclusions: Delivering ESCPs that embed a web-link to a couple-focused, tailored program is feasible and can potentially improve patient outcomes. The promising results need to be validated in a larger definitive trial using a diverse sample.

Keywords

survivorship care plan; prostate cancer; symptom; randomized trial; quality of life; self-management

INTRODUCTION

Approximately 191,930 men will be diagnosed with prostate cancer (PC) in 2020; 90% will have a local or regional disease.[1] Men with localized PC frequently experience distressing symptoms when treated with curative intent (e.g., surgery, radiation with/without hormonal therapy). Symptoms include urinary, sexual, bowel, and hormonal dysfunction,[2–6] distress, fatigue, sleep disturbance, and pain [4] that reduce quality of life (QOL).[7] For men in intimate relationships, PC symptoms also negatively affect their partners [7, 8], who report similar or worse QOL than patients.[7, 9, 10] Supportive care can help manage these negative effects on patients and partners. However, there is a gap in supportive care for couples.[11–14]

Survivorship care plans (SCPs) are a key component of cancer care provided at the end of treatment.[15] SCPs summarize patients' diagnosis and treatment; describe potential complications and late effects; recommend ongoing care (self-management and professional care); and provide resources to address identified issues to improve patient outcomes (e.g., QOL).[16, 17] Research on the effects of SCP, however, has been inconclusive. [18–21] This may relate in part to SCPs' failure to meet specific patient information and care needs.[22] Tailoring SCPs to patients' individual needs may enhance their effectiveness and also provide information relevant to their partners.

To address these unmet needs and fill the gaps in clinical care, our interdisciplinary team conducted a proof-of-concept feasibility study designed to deliver an “enhanced” SCP (ESCP) to men with PC and their partners. ESCP consists of the standard SCP that is *enhanced* by a couple-focused, tailored web-based mHealth PC education program, the Patient Education Resources for Couples (PERC), to improve symptom management at home. We assessed (1) participant enrollment and retention rates; (2) website usage; and (3) program satisfaction and perceived ease of use. We also examined the preliminary effects of ESCP on (1) the primary outcome (QOL); (2) secondary outcomes: appraisal of symptoms (PC-related and general symptoms), and coping resources (i.e., self-efficacy, social support,

and health behaviors to manage symptoms); and (3) exploratory outcome of healthcare utilization. This study was guided by the modified Transactional Theory of Stress [23] that postulates that individuals who face a potentially threatening event (e.g., PC) assess the degree of threat and their resources to cope with it, and then reappraise their situation as either more or less threatening which can affect health outcomes (e.g., QOL).[24] We hypothesized that ESCP users would have more positive appraisal; improved coping resources; better QOL and fewer medical visits than SCP users.

MATERIALS AND METHODS

Study Design

This was a two-group randomized controlled pilot study using a pre-post design [25]. After obtaining informed consent, patients and their partners completed baseline assessments separately via telephone (T1) before being randomly assigned to the SCP (control) or ESCP (intervention) groups using a 1:1 ratio. Couples completed follow-up assessments 4–6 months later (T2) and a semi-structured post-exit interview after T2.

Participants and Setting

After Institutional Review Board approval, men who completed initial treatment with curative intent for localized PC and their partners (i.e., couples) were recruited. Eligibility included men who (1) were diagnosed with localized PC; (2) were within 16 weeks of completing their initial curative intent treatment [26] at genitourinary and radiation oncology clinics at two comprehensive cancer centers in the southeast U.S; (3) were not treated for another cancer in last year; and (4) had a partner > 18 years of age not receiving cancer treatment. Couples had to speak and read English and provide consent.

Study Procedure

The study procedure has been detailed in a previous publication [25]. Briefly, we used convenience sampling to recruit patients and partners from the genitourinary and radiation oncology clinics of two large comprehensive cancer centers in the southeast United States to ensure successful recruitment for this study. After identifying potentially eligible study participants using patient scheduling systems, the research staff met patients before their SCP follow-up visit, provided study information, screened patients and their partners for eligibility and willingness to participate, and obtained informed consent. For patients whose partners were not present at the clinic, research staff screened and consented patients and partners and answered their questions via telephone after eligible patients gave permission to contact their partners. The data collectors collected T1 and T2 data separately from the patient and his partner via telephone. Upon completion of T2 surveys, a trained research nurse interviewed the patient and his partner jointly and then separately via telephone to obtain their feedback on the program.

Intervention

Data collectors and nurses who developed and distributed SCPs were blinded to participants' group assignment. Nurses embedded a web-link in the standard SCPs using a smart text "Insert PERC Here" in the electronic medical record; provided a hardcopy of the SCPs to

the participants; and reviewed the SCP in person or via telephone. These SCPs were also sent to the patients' primary care providers.

Participants were mailed their username and password for accessing the study website embedded in the SCPs. After logging in, couples randomized to the SCP group (control) were directed to the National Cancer Institute PC website (NCI) (<http://www.cancer.gov/types/prostate>), whereas participants in the ESCP group (intervention) were directed to PERC. PERC is a web-based mHealth program with adaptive design so that users can access the program on any device of their preference (e.g., smartphone, tablet, or computer). PERC was designed and developed based on the scientific evidence and input from stakeholders including PC patients, partners, and cancer care providers.[25, 27] Specifically, PERC includes modules about how couples can work effectively as a team, assess and manage prostate cancer treatment-related side effects and symptoms (including urinary and bowel problems, sexual dysfunction, hormonal symptoms, pain, fatigue, sleep disturbance, and stress), and improve healthy behaviors. PERC also provides social support to patients and partners via post-module assignments, a moderated online forum, meetings with a health educator, and a resource center that connects participants and their partners to tools for symptom tracking and monitoring, as well as local and national support groups and resources.

Measurement and Data Collection

We used administrative data to evaluate participant enrollment and retention rates [25]. We used participants' self-reported data and the website's automatic tracking data to assess PERC use. Participants completed the Usability Scale [28, 29] to evaluate program satisfaction and perceived ease of use. We used psychometrically sound, established questionnaires to examine (1) *the primary outcome* QOL (27-item Functional Assessment of Chronic Illness Therapy General Scale, FACT-G [30, 31]); (2) *appraisal of symptoms*: PC symptoms (Prostate cancer Index Composite, EPIC-26 [7, 32]) and general symptoms (21-item Risk of Distress General Symptom Scale[33]); (3) *coping resources*: self-efficacy in symptom management (9-item Cancer Self-Efficacy Scale [34]), social support (informational, emotional, and instrumental using PROMIS measures [35]), and health behaviors to manage symptoms (physical activity and nutrition in health promoting lifestyle profile II [36–39]); and (4) *healthcare utilization* (PC-related post-treatment follow-up visits, emergency room use and hospitalization/readmission) extracted from medical charts. We also collected data of potential control variables including demographics, type of treatment and comorbidities (13-item Charlson Comorbidity Index-Brief [40, 41]).

Statistical analyses

We used SAS (version 9.4, SAS Institute, Inc., Cary, NC) for statistical analyses with one-sided tests at a 0.05 significance level. We calculated descriptive statistics of the control variables, appraisal, coping resources and QOL for PC patients and their partners by group and time. To examine the feasibility of ESCP, we used descriptive statistics to calculate (1) the enrollment and retention rates; (2) self-reported and automatically tracked web activity (the number of visits and the number of participants who visited each webpage), percent of

consistency between patient-reported symptoms and PERC webpages visited; and (3) program satisfaction and perceived ease of use.

We examined the preliminary outcomes of ESCPs vs SCPs based on the intent-to-treat (ITT) principle. First, we fitted linear mixed models in which the dependent variables were the differences of (1) patients' and (2) partners' scores between T1 and T2 of QOL and coping resources. The fixed effects included covariates: the group (i.e., SCP vs ESCP); role (i.e., patient vs. partner); control variables; T1 appraisal of symptoms, coping resources, and QOL; as well as T1-T2 differences in the scores of Charlson comorbidity index and appraisal of symptoms. The random effect was couples' ID that was used to account for the within-couple interdependence.

Second, we fitted separate ANCOVA models to examine the effects of ESCPs on appraisal of symptoms of patients and their partners at the individual level (rather than at the dyad level) because the appraisals of PC-related and general symptoms may vary significantly based on individuals' health conditions. We fitted ANCOVA models on the T1-T2 score differences of patients' EPIC subscales and general symptoms while controlling for the effects of the covariates; T1 EPIC subscales and general symptoms; and T1-T2 differences in the scores of Charlson comorbidity index. We repeated the same procedure for partners to estimate the preliminary effects of ESCPs on partners' appraisal of symptoms.

We conducted post-hoc analyses to examine the preliminary effects of ESCPs on appraisal, coping resources and QOL of individual participants (versus patient-partner dyads). We fitted ANCOVA models for patients and partners separately, while controlling the fixed effects as in the abovementioned linear mixed models for couples.

Finally, we fitted a Poisson regression on the number of patient medical visits within 10 months after baseline to test the effect of ESCPs on healthcare utilization, while controlling for type of treatment, age, income, and comorbidity.

RESULTS

Participant Characteristics

All patient-partner dyads were heterosexual couples. The majority of the 62 couples were white, had a college or higher degree, and income greater than \$60,000 (Table 1). More men elected prostatectomy than radiation in SCP (52% vs 48%) and in ESCP (55% vs 45%), respectively. There were no significant differences in participants' characteristics between SCP and ESCP at baseline.

Feasibility of ESCP

Participant enrollment and retention rates.—Sixty-two couples completed T1 survey (recruitment rate=41.61%) and were randomly assigned to the ESCP (n=31) and SCP (n=31) groups. Couples in ESCP (n=28) and SCP (n=25) completed T2 survey (retention rate = 90.32% vs 80.65%, respectively). Attrition was due to loss to follow-up, withdrawing from study for personal reasons or severe health problems. Figure 1.

Website usage.—Twenty-seven of the ESCP couples (87.10%) and 24 of the SCP couples (77.42%) reported use of the web-based programs. However, the actual web activity tracking data showed less web usage. It indicated that 19 ESCP couples reviewed PERC (61.29%) and 15 SCP couples reviewed the NCI website (48.39%). The most frequently visited PERC webpages were sexual dysfunction, working as a team, working with healthcare team, hormonal, urinary, sleep disturbance (Figure 2). Among 31 ESCP couples, 42% reviewed the PERC webpages that were consistent with the symptoms patients reported. Excluding the 12 couples who never logged into PERC (38.7%), 70% of the individuals/couples reviewed relevant PERC webpages.

Program satisfaction and perceived ease of use.—ESCP patients reported significantly greater program satisfaction and perceived easier navigation of ESCP than those in the SCP group ($p=0.02$ and $p=0.02$, respectively). Table 2.

The ESCP Outcomes

The results of effects of ESCP vs SCP on the coping resources and QOL at the couple level, as well as appraisal of symptoms at individual level are displayed in Table 3. The results of our post-hoc analyses of the preliminary outcomes of ESCP at the patient's or partner's individual levels are displayed in the Supplementary Table.

QOL.—The results of the linear mixed effect models (Table 3) indicated that improvements in all QOL measures of participants in the ESCP against SCP groups were in the expected direction (i.e., FACT-G physical: 0.34, $p=0.27$; social: 0.97, $p=0.08$; emotional: 0.55, $p=0.16$, and total score: 0.65, $p=0.35$), except for functional well-being (-0.46 , $p=0.70$), even though not statistically significant.

Appraisal of symptoms.—ESCP patients, on average, had larger (better) pre-post change in EPIC urinary subscale score than SCP patients ($p<0.01$).

Coping resources.—There was a trend towards less deterioration in self-efficacy in symptom management in ESCP couples than SCP couples (2.21, $p=0.10$). A positive trend was also observed for the PROMIS informational and instrumental support subscales; estimated differences between ESCP and SCP couples were 0.77 ($p=0.29$) and 1.82 ($p=0.09$), respectively.

Healthcare utilization.—Approximately 77.42% patients had less than 6 medical visits (Mean = 4.74, SD=4.58). The numbers of medical visits for ESCP patients were 0.17 fewer than those of the SCP patients within 10 months post-T1 ($p\cong 0.05$).

DISCUSSION

The results of this pilot study indicate that it is feasible to create and deliver enhanced SCPs that incorporate an embedded web-link to a couple-focused, tailored PC symptom management web-based mHealth program (PERC). The preliminary effects of ESCP (SCP + PERC website) compared to a control SCP (SCP + NCI website) indicate that ESCP patients reported better urinary symptom scores and had fewer medical visits than control

SCP patients. A positive improvement trend was observed in the overall, physical, emotional, and social subscale scores of QOL and some coping resources (self-efficacy and informational social support) for patients and partners.

Feasibility

Recruitment and retention.—We screened more than two hundred men with localized PC for this study and enrolled 62 with their partners. Our enrollment rate was lower than enrollment reported in a meta-analysis and systematic review (41.61% vs 53.8%, respectively) whereas our retention rates were higher than in the review (90.32% for ESCP and 80.65% for SCP in our study vs 57.7% in the report, respectively).[42] These findings suggest that once participants enrolled in our study, retention was high especially for the ESCP participants. It is important to note that our recruitment and retention rates were likely affected by multiple destructive hurricanes and tropical storms during 2018 that affected our study catchment areas and significantly affected our ability to recruit participants. In addition, there were significant nursing staff shortages at the recruiting clinics during the study because the mandated SCP implementation – the focus of this study – was perceived to be an extra burden by the clinicians. Nevertheless, we continued our recruitment and retention efforts for the study.

Website usage.—It was surprising that participants reported using the website more than was actually tracked by the website. This may suggest some social desirability bias in participants' reports or that they used the website less than they anticipated. Approximately one-third of the ESCP users never logged into PERC. Findings from our post-exit interviews suggested that some ESCP and SCP users either received extensive information from their providers and families, or had only a few symptoms and thus, did not feel the need to access the additional information. Some partners reported not using the online programs because they were too busy. These findings suggest that patients and partners accessed ESCPs and SCPs based on their care needs and life circumstances.

More than two-thirds of couples reviewed the PERC webpages that were consistent with the symptoms that patients reported. According to post-exit interviews, patients visited the online programs (either PERC or NCI) when they experienced symptoms that they were not familiar with and needed more information. Our findings about the most frequently visited PERC webpages suggest that cancer survivorship programs need to enhance the information on sexual dysfunction, couples working as a team, working with healthcare team, hormonal, urinary, and sleep disturbance as well as health behaviors, all of which are commonly experienced challenges for these couples [2–6, 8]. It is of note that content on “self-care for partners supporting patients”, and “how to work with the healthcare team” were also among the most frequently visited webpages by couples, suggesting that these were important resources.

Program satisfaction and perceived ease of use.—Participants in our ESCP intervention reported significantly greater use of and satisfaction with information on the PERC versus the NCI website, mostly likely because PERC was tailored to their needs. PERC also included PC specific symptom-related modules and information that helped

couples work effectively together and with their healthcare providers, which may also have increased their satisfaction with ESCPs.

The outcomes of ESCPs vs SCPs

ESCP patients reported significantly greater improvement in urinary symptom scores than SCP patients, which may suggest better self-management. Urinary dysfunction is one of the most common and distressing symptoms among PC patients.[43] ESCP patients received information, skills training, and social support for better managing urinary dysfunction.

It is important to note that ESCP patients in this proof-of-concept study had fewer medical visits than SCP patients within 10 months after baseline (approximately 12–14 months post-treatment). PERC provides comprehensive knowledge, skills training, social support and resources that may have helped ESCP patients to recognize and take actions to better manage their symptoms. However, caution is warranted when interpreting this statistically significant result because 0.17 visits in the real world is a very small impact. A well-powered definitive trial is needed to validate the results and understand the mechanism of the ESCP effects.

Compared with the SCP couples, ESCP couples reported improvements, although nonsignificant, in the expected direction in quality of life and in physical, social, and emotional subscales. We also found a trend of less deterioration in self-efficacy in symptom management and a trend of improvement in the informational and instrumental support among the ESCP couples compared to the SCP couples. Our findings are consistent with previous research that has shown that standard SCPs do not improve survivors' physical functioning, self-efficacy, anxiety, cancer-specific distress, and depression [42]. However, our study extends the work to also include the partners. In addition, results of our post-hoc analysis of ESCP effects at individual level indicate that ESCP patients reported significantly greater improvement of informational and instrumental support between T1 and T2 than SCP patients (both $p=0.04$). These findings suggest that involving partner and professionals in symptom management education and skills training may provide PC patients the assistance, services, advice and suggestions needed during their care transition.

Our promising but yet mostly nonsignificant results of the primary outcomes may be due to our use of the NCI PC website for control group. We used auto-direction to the NCI PC website as an attention control to improve the randomization blindness among research staff and nurses. In addition, we used the NCI website to ensure that usual care participants had structured access to evidence-based information. We also used the NCI website to enhance participant equivalence between control and intervention groups because PERC and NCI websites have similar features in terms of information, online chat and support. SCP users' link to the NCI PC website may have attenuated the effects of the ESCP. While there is a need for a definitive trial with sufficient power to test the effectiveness of ESCP, future research may use standard care as control to more clearly demonstrate the intervention effects of the ESCPs.

Limitations and future directions

One limitation was the homogeneity of participants, who were mainly white and heterosexual. Majority of the participants had college or higher degree and an income greater than \$60,000. Future research needs to include couples who are more diverse in terms of sexual orientation, race, and socio-economic status. Second, this study focused on couples. Future research is needed to explore strategies to enhance survivorship care planning for single men with PC from diverse background. Third, this pilot study had a small sample that limited our ability to examine differences by type of treatment men received (radiation versus surgery) and also limited the extent to which we could examine more aspects of health care utilization (e.g., primary care provider visits). We also conducted one-tailed test in this underpowered proof-of-concept study. Future research needs to use two-tailed test and a sufficiently powered sample to examine both positive and negative effects of the ESCP and SCP. This study was conducted in an NCI-comprehensive cancer center. Future research needs to consider ways to implement and disseminate programs like PERC in community-based cancer centers. Finally, we did not track the cost of the development of PERC that took several years in multiple phases. In this proof-of-concept pilot study, we integrated our study into standard clinical practice to reduce the cost of implementation and dissemination. The only cost for the clinic was the staff's time for completing the SCP and explaining to the patients and their partners the SCP. Future research should track the cost of program development and maintenance. PERC is a standalone program that can be used in any settings and open to the public just like the NCI, American Cancer Society, and other websites. The PERC website could also be publicized on the websites of cancer centers and searchable through [google.com](https://www.google.com) and other search engines once it is open to the public. Once proven efficacious using a well-powered sample, we will work on translation and dissemination so that PERC is available in other community-based sites and open to the public.

Conclusions

The results of our study indicate that it is feasible to integrate existing web-based interventions such as PERC into standardized SCPs. Our evaluation yielded promising results about patients' improved urinary symptoms, coping resources, and QOL, and fewer medical visits. Future research with sufficient power is needed to test the effectiveness of ESCP as compared to usual care.

Supplementary Material

Refer to Web version on PubMed Central for supplementary material.

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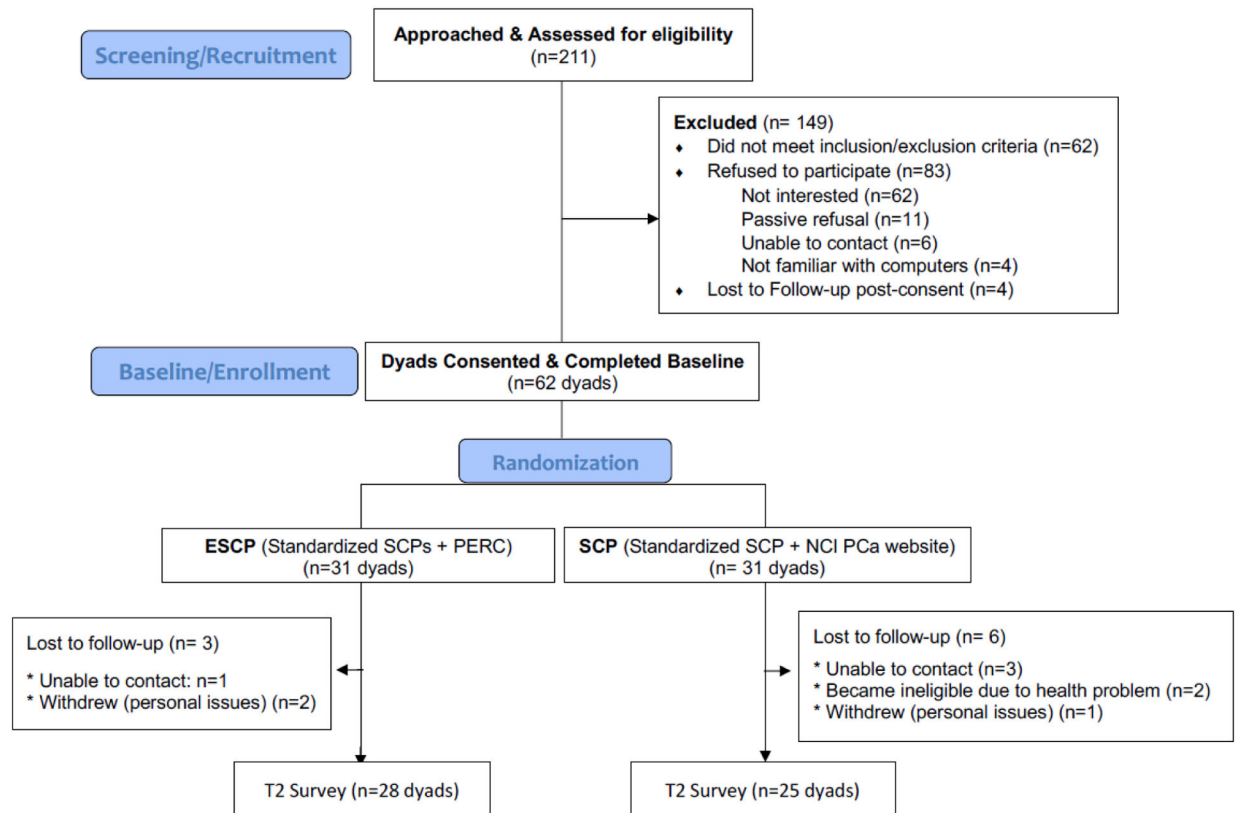


Figure 1.
Flow through RCT

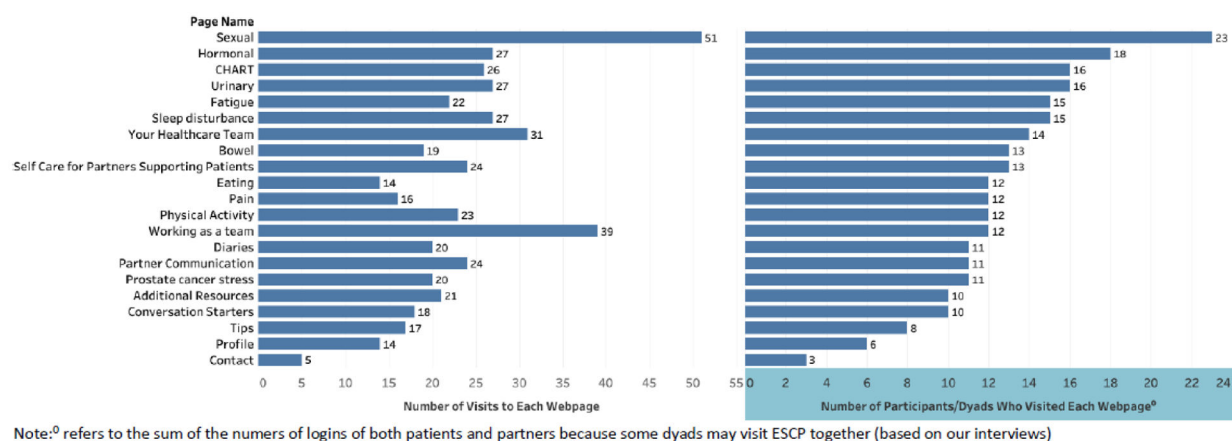


Figure 2:
Use of The Intervention Website Via ESCP

Table 1.

Participant Characteristics

Characteristics	Patients						Partners					
	SCP (N=31)			ESCP (N=31)			SCP (N=31)			ESCP (N=31)		
	N	%	N	%	N	%	N	%	N	%	N	%
Gender												
Male	31	100%	31	100%	0	0%	0	0%	0	0%	0	0%
Female	0	0%	0	0%	31	100%	31	100%	31	100%	31	100%
Race												
White	24	77.42%	22	70.97%	22	70.97%	22	70.97%	22	70.97%	22	70.97%
Black	6	19.35%	8	25.81%	7	22.58%	7	22.58%	8	25.81%	8	25.81%
Other	1	3.23%	1	3.23%	2	6.45%	2	6.45%	1	3.23%	1	3.23%
Education												
Less than college	13	41.94%	16	51.61%	15	48.39%	15	48.39%	13	41.94%	13	41.94%
Bachelor's Degree	10	32.26%	4	12.90%	7	22.58%	7	22.58%	10	32.26%	10	32.26%
Graduate Degree (Master's PhD, JD, MD, etc.)	8	25.81%	11	35.48%	9	29.03%	9	29.03%	8	25.81%	8	25.81%
Employment Status												
Yes	15	48.39%	20	64.52%	17	54.84%	17	54.84%	14	45.16%	17	54.84%
No	16	51.61%	11	35.48%	14	45.16%	14	45.16%	17	54.84%	17	54.84%
Income												
<= \$60,000	9	29.03%	8	25.81%	11	35.48%	11	35.48%	9	29.03%	9	29.03%
> \$60,000	19	61.29%	20	64.52%	15	48.39%	15	48.39%	19	61.29%	19	61.29%
Don't know/refused	3	9.68%	3	9.68%	5	16.13%	5	16.13%	3	9.68%	3	9.68%
Type of treatment												
Radiation	16	51.61%	17	54.84%								
Surgery	15	48.39%	14	45.16%								
Time Point												
Charlson comorbidity index	T1	Mean	SD	Mean	SD	Mean	SD	Mean	SD	Mean	SD	SD
		4.13	1.65	4.77	2.35	3.58	1.84	3.65	1.87			
Age	T2	Mean	SD	Mean	SD	Mean	SD	Mean	SD	Mean	SD	SD
		4.06	1.79	4.10	2.34	3.10	2.02	3.48	2.11			
Note:												

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The characteristics and control variables were not statistically different between ESCP and SCP at baseline for both the patients and partners.
The number of patients and partners were 31 in ESCP and SCP at baseline. The number of patients and partners were various in groups at T2.

Table 2.

Program Satisfaction and Perceived Ease of Use (assessed at T2)

Outcomes	Score Range	Patients			Partners		
		SCP (N=27)		ESCP (N=28)	SCP (N=25)		ESCP (N=28)
		Mean (SD)		Mean (SD)	Mean (SD)		P
Program Satisfaction ¹	11–55	30.48(11.47)		36.30(8.11)	36.29(13.54)		0.02 [*]
Perceived Ease of Use ¹							
General	3–15	12.44 (1.58)		12.60 (1.29)	12.68 (1.53)		0.36
Content	4–20	17.11 (2.37)		17.32(1.99)	16.83 (2.26)		0.38
Navigation	9–45	33.89 (5.26)		36.84(3.93)	34.79 (4.80)		0.02 [*]

Note:

¹. Higher scores indicated more satisfaction and easier perceived of use;

². SCP users had access to NCI website and the ESCP users had access to PERC website.

³. ^{*} p < .05

Table 3.

Magnitude of Benefit of the ESCPs vs SCPs at Couple's Level

(One-sided test. i.e., only looking for positive change)

Primary Outcomes		SCP ^[1]				[1] ESCP		Coefficient ^[2]	P
		Role	Baseline		Post		Post		
			Mean (SD)	Mean (SD)	Mean (SD)	Mean (SD)			
FACT-G: † Physical Well-being	Patient	24.16 (3.36)	24.19 (5.19)	23.03 (4.62)	23.86 (5.15)	0.34	0.27		
	Partner	24.94 (2.68)	24.40 (3.57)	24.65 (2.69)	24.54 (3.65)				
FACT-G: † Social/Family Well-being	Patient	22.25 (5.02)	22.04 (5.35)	23.55 (3.45)	23.89 (3.25)	0.97	0.08		
	Partner	23.45 (4.46)	23.25 (4.99)	23.87 (3.85)	24.29 (3.18)				
FACT-G: † Emotional Well-being	Patient	20.93 (3.59)	20.85 (3.89)	21.42 (3.14)	21.32 (3.37)	0.55	0.16		
	Partner	20.74 (2.62)	20.92 (3.11)	21.13 (2.36)	21.61 (2.50)				
FACT-G: † Functional Well-being	Patient	21.94 (5.84)	22.59 (6.08)	22.76 (4.75)	23.21 (5.59)	−0.46	0.70		
	Partner	22.66 (4.36)	23.10 (5.06)	23.68 (3.79)	23.25 (4.82)				
FACT-G: † Total Score	Patient	89.27 (14.56)	89.67 (18.30)	90.76 (12.98)	92.29 (14.88)	0.65	0.35		
	Partner	91.78 (10.52)	91.67 (13.27)	93.33 (9.49)	93.68 (11.29)				
Coping Outcomes									
Self-efficacy in symptom management: CASE †									
PROMIS:	Patient	83.81 (7.98)	83.41 (9.04)	84.00 (7.04)	83.43 (7.24)	2.21	0.10		
	Partner	85.71 (5.35)	83.96 (8.64)	84.26 (7.11)	84.75 (7.77)				
	Patient	58.38 (10.15)	58.12 (9.71)	57.68 (8.02)	58.98 (6.63)	0.77	0.29		
	Partner	58.75 (9.43)	59.23 (9.02)	58.57 (8.81)	58.36 (8.73)				
Informational Support †	Patient	57.65 (6.39)	58.06 (7.58)	58.35 (6.97)	59.42 (6.14)	0.03	0.49		
	Partner	55.71 (7.52)	56.08 (7.40)	57.46 (7.80)	56.14 (7.40)				
Emotional Support †	Patient	59.55 (7.71)	60.18 (7.00)	60.97 (6.29)	62.00 (5.54)	1.82	0.09		
	Partner	57.29 (7.20)	55.46 (7.22)	57.46 (7.80)	55.15 (9.52)				
Instrumental Support †	Patient	2.54 (0.87)	2.59 (0.84)	2.71 (0.58)	2.63 (0.69)	−0.01	0.55		
	Partner	2.58 (0.78)	2.52 (0.63)	2.45 (0.58)	2.46 (0.57)				
Health Promoting Lifestyle:	Patient	2.66 (0.54)	2.61 (0.62)	2.81 (0.43)	2.67 (0.58)	0.07	0.16		
	Partner	2.78 (0.61)	2.68 (0.61)	2.96 (0.56)	2.88 (0.48)				

Appraisal Outcomes	Baseline	Post	Baseline	Post	Coefficient ^[3]	P
Appraisal of PCa Symptoms: EPIC						
Urinary [^]	Patient	67.76 (21.69)	79.26 (17.13)	68.43 (22.97)	87.74 (12.98)	8.04 ^{**}
	Partner	1.74 (0.93)	1.36 (0.76)	2.03 (1.38)	1.68 (1.22)	0.24
Bowel [^]	Patient	92.07 (9.02)	94.91 (9.27)	86.02 (20.31)	91.46 (13.93)	0.64
	Partner	1.32 (0.75)	1.12 (0.60)	1.39 (0.88)	1.32 (0.86)	0.23
Sexual [^]	Patient	27.56 (25.37)	30.11 (30.31)	24.29 (26.47)	33.36 (32.63)	5.29
	Partner	1.97 (1.40)	2.00 (1.50)	1.77 (1.26)	2.18 (1.47)	0.36
Hormonal [^]	Patient	85.69 (18.08)	87.78 (18.52)	83.23 (17.54)	86.96 (17.18)	-0.24
	Partner	1.84 (1.27)	1.88 (1.36)	1.87 (1.18)	1.71 (1.12)	-0.15
Appraisal of General Symptoms[‡]	Patient	6.92 (4.71)	5.64 (5.45)	7.72 (5.02)	5.15 (5.85)	-1.26
	Partner	4.90 (5.04)	4.57 (5.26)	4.61 (3.52)	3.51 (3.51)	-0.31
Healthcare Service Utilization[‡]	Patient		4.84 (4.68)		4.65 (4.56)	-0.17

Note:

[‡]: Higher scores indicated more positive results: i.e., better quality of life, higher self-efficacy in symptom management, more social support, better health behaviors in physical activity and in nutrition

[^]: Higher scores indicated opposite results by role: For PCa symptoms, patient with lower EPIC score indicated more severe symptoms and partner with lower score mean appraisal of symptoms was higher (less severe symptoms). The range of EPIC scores is 0–100 for patients and the range of appraisal of symptoms scores is 0–5 for partners.

[‡]: Higher scores indicated more negative results: i.e., more severe general symptoms; more PCa-related post-treatment follow-up visits; and more PCa-related emergency room use and readmission.

* p \geq 0.05;

** p< .01

[1] The number of patients and partners were 31 in ESCP and SCP at baseline. The number of patients and partners were various in groups at T2.

[2] The coefficients and p-values for couple correlated measurements (i.e., QOL, Self-efficacy, social support and health behaviors) are at the couple level. The coefficient represents the effect of ESCP on overall pre-post change in score for a couple. Using FACT-G PW as an example, the coefficient is 0.34, this means that couples in the ESCP arm, on average, has larger (0.34) pre-post change in FACT-G PW than couples in the SCP arm.

[3] The coefficients and p-values for measurements of individual changes may differ for patients and partners (i.e., PCa symptoms and appraisal of general symptoms) are at the individual level (values are different patients and partners).