

ARTICLE



Factors associated with various strategies for maintaining sexual activity after prostate cancer treatment

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Many men experience sexual difficulties after receiving prostate cancer treatment. We investigated sexual and relationship factors associated with management strategies to maintain sexual activity in prostate cancer patients. 210 prostate cancer patients (66.7 ± 7.4 years old) completed our survey online. Higher sexual function distress (Incidence rate ratio, IRR = 0.99, $p = 0.005$) and less frequent relationship strain (IRR = 1.01, $p = 0.002$) were associated with trying a higher number of sexual management strategies. Higher sexual function distress was associated with the use of oral medication (Odds Ratio, OR = 0.98, $p = 0.026$), vacuum erection device (OR = 0.98, $p = 0.005$), and vibrators (OR = 0.97, $p = 0.005$). Perceived importance of sexual interaction with a partner was associated with using oral medication (OR = 1.95, $p = 0.027$). Participant's higher ideal frequency of sexual interaction with a partner was a predictor for the use of vibrators (OR = 1.03, $p = 0.024$). Less frequent relationship strain was associated with the use of vacuum erection device (OR = 1.03, $p = 0.002$), and vibrators (OR = 1.02, $p = 0.012$). Lastly, patients' communication with their partner about sexual intimacy was also associated with use of vacuum erection device (OR = 3.24, $p = 0.050$, CI 1.0–10.5). Few participants (13–27%) were interested in trying penile implant, penile support device, external penile prosthesis, penile sleeve and anal devices. From our qualitative analyses, the main barriers to retaining sexual activity were erectile dysfunction and psychological issues. Three themes participants found useful to maintain sexual activity: preparatory behaviours for initiating or maintaining erections, adapting their sexual activity to fit with what was now possible, and the importance of the relationship or intimacy with their sexual partner. Psychological and relationship factors contribute to patients' motivation to remain sexually active after treatment.

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INTRODUCTION

Sexual dysfunction is commonly experienced by men with prostate cancer (PCa) [1, 2]. Despite having sexual dysfunction, some patients remain sexually active following PCa treatment [3–7]. To maintain sexual activity, patients are commonly prescribed oral phosphodiesterase 5 inhibitors pre-operatively [8] or post-operatively [9]. Other treatment that patients could receive include intracavernosal injection [9], vacuum erection device (VED) [8] or penile implant [10]. Other non-invasive sexual devices (e.g. external penile prosthesis, penile sleeve, penile support device, vibrators) could also be used for sexual activities; but, they may be marketed as sex toys and are not well-studied in the context of PCa patients [11].

There are published data to show that some men with PCa use non-invasive sexual devices for sexual activities. Specifically, 26% of penile sleeve buyers and 65% of penile support device buyers have PCa [11] and Wibowo et al. found 9% of men with PCa on androgen deprivation therapy (ADT) with erectile dysfunction had used sex toys for sexual activity [12]. In one case report, a man with PCa used a strap-on dildo for sexual activity after he had sexual problems following PCa treatment [13]. Beyond this research, however, little research examines factors associated with sexual management strategies use.

Here, we conducted a cross-sectional study with the aims to determine: (1) Sexual and relationship factors associated with the number and type of sexual management strategies used by patients; (2) Patients' reasoning for not trying various sexual management strategies; (3) Patients' descriptions of how they maintained sexual activity after receiving PCa treatment.

METHODS

Participants & recruitment

We recruited participants online between February and October 2019. PCa organizations (Prostate Cancer Foundation New Zealand, Prostate Cancer International, and the Prostate Cancer Mailing List, American Cancer Society's Cancer Survivors Network) and several sex device companies (Aneros, RxSleeve and Elator) distributed our survey link either on their mailing list, social media or online forum. The survey was built on the Research Electronic Data Capture (REDCap) database, hosted at the University of Otago and is subject to the New Zealand Health Information Privacy Code. The survey link was not password-protected but the link was specific for this survey. Participation was on voluntary basis and the study was open to all PCa patients. Participants needed to be above 18 and fluent in English. The study protocol was approved by the University of Otago Human Ethics Committee (H18/107).

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After clicking the survey link, potential participants were asked if they had received PCa treatment. Only those who answered “Yes” viewed the Participant Information Sheet and Consent Form. The Participant Information Sheet indicates that our team (with EW listed as the principal investigator) is investigating how PCa patients manage sexual dysfunction, specifically on what type of management strategies patients prefer to use, and what type of sexual activities patients prefer to engage in when facing sexual problems. We also stated that data from this study can help clinicians provide better care for PCa patients who experience sexual problems. Potential participants were informed that the survey takes about 15 min to complete. Participants were able to go back to previous pages, but there was no review page at the end of the survey. Lastly, we indicated that research data collected from this survey will be stored in the REDCap database, which is hosted at the University of Otago and is subjected to the New Zealand’s Health Information Privacy Code. The REDCap database is password-protected and only study team members will have access to this database, and research data will be kept for a minimum of 10 years after the data are published.

Participants who consented to participate then proceeded to the survey. Research data were automatically captured in REDCap. The survey took ~15 min to complete, and at the end of the survey, participants were asked if they wished to enter into a raffle for a \$100 NZD gift card. One participant was randomly chosen to win this gift card.

Of the 460 people who clicked the survey link, 33 had not received PCa treatment and a further 217 did not complete the survey. Complete data were available for 210 participants.

Measures

Demographics. Participants were asked basic demographic questions including their relationship status, age, gender, ethnicity, education level, employment, income status, medical conditions and treatment history.

Use of sexual management strategies. Participants were asked to indicate which sexual management strategies they had used to assist in sexual activity. The options were oral medications, VED, penile implant, penile support device, external penile prosthesis, penile sleeve, vibrators anal devices. If participants indicated they had not used the strategy they were asked if they would consider using them for maintaining sexual activity. If they answered “No”, they were asked why they would not consider using them.

Arizona sexual experience scale. We assessed sexual function using the male version of the Arizona Sexual Experience Scale [14]. The questionnaire measures strength of sex drive, ease of getting aroused, ease of getting and keeping an erection, ease of reaching an orgasm, and orgasm satisfaction. Items are rated on a 1–6 scale with a higher score indicating lower sexual functioning. The internal consistency in our sample was $\alpha = 0.82$.

Sexual activity questions. We used items from the Expanded Prostate Cancer Index Composite (EPIC) [15] to assess sexual frequency, and extent of distress or bother experienced as a result of sexual function problems. In addition, we asked “What is your ideal frequency of sexual activity with a partner?” with the same answer options as the sexual frequency question from the EPIC. We also included a question “How important is your sexual interaction with a partner?” and the answers ranging from “not important at all” to “extremely important”, with a higher score indicating more importance.

Relationship quality. For measuring relationship quality, we included the “Relationship Assessment Scale” [16]. The internal consistency in our sample was $\alpha = 0.80$. We also added two additional questions measuring relationship strain and discussion about expectations for sexual intimacy after PCa treatment. These are “During the last 4 weeks, how often have you experienced strain in your intimate relationships?” and “Have you ever discussed your expectation for sexual intimacy with your partner after PCa treatment?” The answer options for the question on relationship strains were “more than once a day”, “about once a day”, “more than once a week”, “about once a week”, and “rarely or never”, with lower score indicating more frequency in relationship strains. The latter question could be answered with a “yes” or “no”.

Statistical analysis

Statistical analyses were performed using StataSE 15. Demographic data and sexual management strategies use were summarised by descriptive statistics. Poisson regression analyses were performed to determine associations between sexual factors (sexual function, sexual function

distress, ideal frequency of partnered sexual activity, perceived importance of partnered sex) or relationship factors (relationship satisfaction, sexual intimacy communication with a partner, relationship strain, partner’s age) and the number of preferred sexual management strategies, while controlling for age, income, and past ADT use. Logistic regression was used to investigate various factors in preferring to use several sexual management strategies, while controlling for age, income, and past ADT use. Regressions were not performed for some devices because the number of participants who had used them were fewer than five. $P < 0.05$ was considered as statistically significant.

Qualitative analysis

An exploratory thematic analysis was performed on two questions. The analysed data included 120 responses to the question “Please enter any additional comments on what helps you maintain sexual activity”, and 140 responses to the question “Have you ever discussed your expectation for sexual intimacy with your partner after PCa treatment? Please provide more detail”.

Data were analysed using thematic analysis as guided by Braun and Clarke’s [17] steps. The approach to analysis was theoretical and focused on explaining how sexual activity was maintained despite post-treatment sexual difficulties. Coding was done at the semantic level and the analysis was framed within an essentialist epistemology. Initially all the responses were read and initial notes were taken. Then the data were reread and labelled with a code. Codes were collated and read focusing on the content of each code in comparison to other codes. Three themes we developed relating to how men maintain sexual activity post treatment.

Each of the themes is explained below including extracts of participants’ responses to illustrate the theme. Each extract includes the participant number and extracts that include (...) indicate that part of the response has been edited out for brevity.

RESULTS

Demographics

Complete data were available for 210 participants (Table 1). Participants were 66.7 ± 7.4 years old. The majority were Caucasian (78%), in a long-term relationship (94%) for 31.3 ± 16.0 years, and married (82%). Their partners were 62.9 ± 9.0 years, and 93% were female. Many had medium-size household income (58%), retired (55%) and had completed at least one university degree (71%). A large proportion (69%) of participants had previously received prostatectomy. In addition, 38% had been treated with external beam radiation, and 25% with ADT.

In terms of sexual function, 94.3% of participants still had some level of sex drive, 96.2% could still get sexually aroused, 71% were able to achieve and maintain an erection, and 91.9% could still reach an orgasm.

Number and type of sexual management strategies use

Higher sexual function distress ($IRR = 0.99$, $p = 0.005$) and less frequent relationship strain ($IRR = 1.01$, $p = 0.002$) were associated with higher number of management strategies that participants preferred to use (Table 2). In terms of specific sexual management strategies (Table 3), higher sexual function distress was associated with the use of oral medication ($OR = 0.98$, $p = 0.026$), VED ($OR = 0.98$, $p = 0.005$), and vibrators ($OR = 0.97$, $p = 0.005$). Perceived importance of sexual interaction with a partner was also associated with using oral medication ($OR = 1.95$, $p = 0.027$). Furthermore, participant’s higher ideal frequency of sexual interaction with a partner was a predictor for the use of vibrators ($OR = 1.03$, $p = 0.024$). In addition, less frequent relationship strain was associated with the use of VED ($OR = 1.03$, $p = 0.002$), and vibrators ($OR = 1.02$, $p = 0.012$) (Table 4). Lastly, patients’ communication with their partner about sexual intimacy was also associated with use of VED ($OR = 3.24$, $p = 0.050$, $CI 1.0–10.5$).

Unused strategies

Table 5 shows the numbers of participants who had not used the various strategies, and proportions who were willing to try them.

Table 1. Demographic data from 210 participants from this study.

| Parameters | n (%) or mean (standard deviation) |
|--------------------------------------|------------------------------------|
| Age (y) | 66.7 (7.4) |
| Ethnicity | |
| Caucasian | 163 (78%) |
| Non-Caucasian | 47 (22%) |
| Marital status | |
| Currently in a relationship | 198 (94%) |
| Age of partner (y) | 62.9 (9.0) |
| Relationship duration | 31.3 (16.0) |
| Gender of partner | |
| Male | 13 (7%) |
| Female | 181 (93%) |
| Relationship status | |
| Never married | 8 (4%) |
| Common law | 6 (3%) |
| Divorced | 13 (6%) |
| Married/civil union | 173 (82%) |
| Separated | 1 (1%) |
| Widowed | 9 (4%) |
| Education | |
| Completed ≥1 University degree | 149 (71%) |
| Employment | |
| Full-time | 65 (31%) |
| Part-time | 25 (12%) |
| Currently seeking work | 5 (2%) |
| Retired | 115 (55%) |
| Income | |
| Low | 66 (34%) |
| Medium | 113 (58%) |
| High | 17 (8%) |
| Treatment history | |
| Radical prostatectomy | 144 (69%) |
| External beam radiation | 79 (38%) |
| Brachytherapy | 20 (10%) |
| Cryotherapy | 2 (1%) |
| Active surveillance/watchful waiting | 47 (22%) |
| ADT | 53 (25%) |
| Antiandrogens | 26 (12%) |
| Other treatment | 25 (12%) |

ADT Androgen deprivation therapy.

Out of 210 participants, the top five strategies that participants had not used included the penile support device, penile sleeve, penile implant, external penile prosthesis and anal devices. Only some (13–27%) participants were interested in trying them for sexual activities. Three strategies that had many (37–53%) participants interested in trying included oral medication, vibrators and VED. In addition, 34 (21%) participants reported that they had used “other” management strategies including penile injection, penile ring or by being the receptive partner in anal sex.

Table 2. Associations between higher number of sexual management strategies use and sexual and relationship factors.

| Parameters | IRR | 95% CI | P value |
|--|-------------|-----------------------|--------------|
| <i>Sexual parameters</i> | | | |
| 1. Sexual function | 0.99 | (0.963, 1.02) | 0.496 |
| 2. Sexual function distress | 0.99 | (0.990, 0.998) | 0.005 |
| 3. Ideal frequency with partner | 1.00 | (0.998, 1.01) | 0.205 |
| 4. Importance of sexual interaction with partner | 1.02 | (0.884, 1.18) | 0.757 |
| Age | 0.992 | (0.977, 1.01) | 0.336 |
| Income | 0.891 | (0.727, 1.09) | 0.261 |
| ADT Use | 1.27 | (0.950, 1.69) | 0.107 |
| <i>Relationship factors</i> | | | |
| 1. Relationship Satisfaction | 1.02 | (0.993, 1.05) | 0.132 |
| 2. Sexual intimacy communication | 1.05 | (0.748, 1.46) | 0.796 |
| 3. Relationship strain | 1.01 | (1.00, 1.01) | 0.002 |
| 4. Partner's age | 1.01 | (0.983, 1.03) | 0.639 |
| Age | 0.989 | (0.964, 1.01) | 0.422 |
| Income | 0.873 | (0.701, 1.09) | 0.224 |
| ADT Use | 1.16 | (0.884, 1.53) | 0.278 |

ADT Androgen deprivation therapy, CI confidence interval, IRR Incidence Rate Ratio.

Statistically significant $p < 0.05$ values are in bold.

Table 3. Associations between various sexual management strategies and sexual parameters.

| Parameters | OR | P value |
|--|-------------|--------------|
| <i>Oral medication</i> | | |
| Sexual function | 0.91 | 0.107 |
| Sexual function distress | 0.98 | 0.026 |
| Ideal frequency with partner | 0.99 | 0.489 |
| Importance of sexual interaction with partner | 1.95 | 0.027 |
| <i>Vacuum erection device</i> | | |
| Sexual function | 0.98 | 0.745 |
| Sexual function distress | 0.98 | 0.005 |
| Ideal frequency with partner | 1.02 | 0.149 |
| Importance of sexual interaction with partner | 1.04 | 0.875 |
| <i>Penile injection</i> | | |
| Sexual function | 0.95 | 0.352 |
| Sexual function distress | 0.99 | 0.281 |
| Ideal frequency with partner | 1.01 | 0.546 |
| Importance of sexual interaction with partner | 0.62 | 0.073 |
| <i>Vibrators</i> | | |
| Sexual function | 0.99 | 0.891 |
| Sexual function distress | 0.97 | 0.005 |
| Ideal frequency with partner | 1.03 | 0.024 |
| Importance of sexual interaction with partner | 0.91 | 0.527 |

Each model is controlled for past ADT use, age, and income.

ADT Androgen deprivation therapy, OR Odds ratio.

Statistically significant $p < 0.05$ values are in bold.

Table 4. Associations between various sexual management strategies and relationship factors.

| Parameters | OR | P value |
|--------------------------------------|-------------|--------------|
| <i>Oral medication</i> | | |
| Relationship satisfaction | 1.09 | 0.126 |
| Sexual intimacy communication | 0.52 | 0.350 |
| Relationship strain | 1.03 | 0.055 |
| Partner's age | 0.98 | 0.592 |
| <i>Vacuum erection device</i> | | |
| Relationship satisfaction | 1.06 | 0.187 |
| Sexual intimacy communication | 3.24 | 0.050 |
| Relationship strain | 1.03 | 0.002 |
| Partner's age | 1.08 | 0.074 |
| <i>Penile injection</i> | | |
| Relationship satisfaction | 1.04 | 0.421 |
| Sexual intimacy communication | 0.65 | 0.479 |
| Relationship strain | 1.02 | 0.083 |
| Partner's age | 1.03 | 0.515 |
| <i>Vibrators</i> | | |
| Relationship satisfaction | 1.05 | 0.390 |
| Sexual intimacy communication | 0.72 | 0.598 |
| Relationship strain | 1.02 | 0.012 |
| Partner's age | 0.98 | 0.645 |

Each model is controlled for past ADT use, age, and income.
ADT Androgen deprivation therapy, OR Odds ratio.
Statistically significant $p < 0.05$ values are in bold.

Table 5. Number and percentage of non-users who were willing to try the various sexual management strategies.

| Management strategies | Users | Non-Users | Non-Users who were willing to try |
|----------------------------|-------|-----------|-----------------------------------|
| Oral Medication | 170 | 40 | 19 (52.8%) |
| Penile Implant | 5 | 205 | 47 (26.6%) |
| Penile Support Device | 3 | 207 | 38 (22.5%) |
| Vacuum Erection Device | 81 | 129 | 41 (37.3%) |
| External Penile Prosthesis | 6 | 204 | 22 (13.6%) |
| Penile Sleeve | 3 | 207 | 47 (28.5%) |
| Vibrators | 36 | 174 | 71 (47.0%) |
| Anal Devices | 13 | 197 | 21 (13.1%) |

Among those who were not willing to try the strategies, we asked for their reasons for their lack of interests in these strategies (Table 6). Except for oral medications, many participants (56–75%) found the remaining strategies unappealing. About 7–16% were not willing to try them because their doctor did not recommend them. A higher proportion of participants did not know what penile support device (23%) and penile sleeve (21%) were, as compared to other strategies (<9% did not know each other device). Furthermore, 9–24% participants were not interested in the various strategies because they were not bothered by sexual problems.

Qualitative findings

Analysis of the answers to the open response questions offered further information about the difficulties men faced post treatment and how they were able to maintain a satisfying sex life despite having sexual difficulties.

Men described various barriers which prevented them from engaging in sex as they had previously. For example, many of the men experienced difficulties in initiating or maintaining erections. However, the side effects or cost of products that aided erections limited some men's willingness or ability to use them. "The injections have helped me obtain an erection. The problem with the injections is it hurts" (P28), "[Almost] 2 years and no partner (...) the full cost of an implant not sure about it" (P166).

Some men also indicated psychological barriers to maintaining sexual activity. For example, one participant explained the importance of "Keeping my mind from thoughts of failure and being only half a man post-surgery" and indicated that he was "unable to fulfill her needs" (P33). Another participant commented that "Trying to make love without an erection suitable for vaginal penetration causes shame" (P52). Some participants indicated that they did not talk to their partners about these sexual difficulties. "This is a difficult discussion to have and we haven't managed to have it. It has been more than 15 months since we last had intercourse" (P129). For some men the barriers that resulted from their treatment were insurmountable. "If you can't get hard what good is it! It's a joke! (...) Nothing works!! Without a Prostate you might as well give it up!!" (P158).

Men who indicated that they maintained some type of sexual activity described a range of both physical and interpersonal factors that allowed this to happen. Three main themes are described below, but these were not exclusive groups and many men indicated a combination of several or all of these aspects as helping them to maintain sexual activity.

Preparation

Participants indicated diverse activities that were used to prepare themselves for sex by initiating an erection. These preparatory activities included erotic material, medical interventions and lifestyle changes. Many of the men indicated using written or visual erotic material as a way to initiate a sexual response, most commonly the use of pornography. "Pornography helps get an erection; hands on action helps keep it there" (P73) "For now, our sex life is basically mutual assisted masturbation, while watching porn" (P68). Medical interventions like drugs or implants were also mentioned as aids that helped initiate and maintain erections. "Aviptadil has been excellent for about 5 years. Orgasm achieved but not too quickly" (P40). "Use of a VED helps me maintain sexual activity" (P53). A small number of men also emphasised the importance of a generally healthy lifestyle to ensure their body was in working order. "Staying fit and living an active lifestyle is key. Maintaining an ideal weight for my age and height is also very helpful" (P97).

Redefining sex

Many participants indicated that they were no longer able to engage in penetrative sex but they engaged in a range of sexual acts. These activities suggested that they had adapted their sex lives and found ways to redefine how they previously thought of and engaged in sex. "Non-penetrative activities, including oral and mutual masturbation" (P157). "I use toys on my wife. By not being overly reliant on penile performance, I believe any perceived pressure is relieved. Also, using anal stimulation to augment penile stimulation helps make up for any deficits" (P7).

Open discussion about post treatment barriers seemed to be an important aspect of the men and their partner's finding ways to overcome these barriers and adapt so that sex was still mutually pleasurable. For example, one participant explained that his sex life had adapted to include "Increased oral sex for both, or oral for me with my wife using a vibrator". He also emphasised the important role communication with and enthusiasm from his wife played in allowing this adaption "We have very open communication about our sexuality and my wife immersed herself into research and actively helping with rehabilitation post-surgery. (...)

Table 6. Number and percentage of non-users with the different reasons for not willing to use various devices.

| | <i>n</i> | Don't know what this is | Was never recommended to me | Does not appeal to me | Not bothered by sexual problems | Other reasons |
|----------------------------|----------|-------------------------|-----------------------------|-----------------------|---------------------------------|---------------|
| Oral Medication | 17 | 0 | 4 (24%) | 5 (29%) | 4 (24%) | 5 (29%) |
| Penile Implant | 130 | 4 (3%) | 12 (9%) | 95 (73%) | 16 (12%) | 10 (8%) |
| Penile Support Device | 131 | 30 (23%) | 13 (10%) | 73 (56%) | 13 (10%) | 6 (5%) |
| Vacuum Erection Device | 69 | 3 (4%) | 5 (7%) | 50 (72%) | 8 (12%) | 5 (7%) |
| External Penile Prosthesis | 140 | 7 (5%) | 12 (9%) | 101 (72%) | 14 (10%) | 10 (7%) |
| Penile Sleeve | 118 | 25 (21%) | 16 (14%) | 66 (56%) | 13 (11%) | 6 (5%) |
| Vibrators | 80 | 6 (8%) | 13 (16%) | 49 (61%) | 11 (14%) | 3 (4%) |
| Anal Devices | 139 | 10 (7%) | 12 (9%) | 104 (75%) | 13 (9%) | 6 (4%) |

Participants were allowed to choose multiple reasons.

Her enthusiasm to keep our sex life going was my biggest motivator" (P6).

Close relationship with partner

A caring and supportive partner was mentioned by many participants as a key part of maintaining their sexual activity. "Good emotional attachment, mutual interest in satisfying each other, excitement" (P69). "We are a married gay couple with about the same level of sexual desire. My husband is very understanding and we work together to satisfy each other" (P172).

Close relationships with partners appeared to come along with open communication which, as outlined above, was an important part of maintaining sexual interactions. "Being open and honest with my partner about what is happening to me has ensured that post treatment we have been able to explore our sexual intimacy to a point where we are mutually satisfied" (P148).

DISCUSSION

Several main findings from this study are: (1) sexual function distress and relationship strains are important factors determining how many sexual management strategies patients will explore, (2) sexual function distress, perceived importance or ideal frequency for partnered sex, relationship strains, and/or communication with sexual partner about sexual intimacy may contribute to the use of certain sexual management strategies, (3) patients have moderate interest in trying out oral medication, vibrators and VED, but less so for the other devices, (4) patients' willingness in trying a new strategy is dampened if they find the strategy unappealing, more so than because of not knowing the strategy or not being recommended by their clinician.

From the qualitative responses, many reported that difficulties in initiation and maintaining erections acted as barriers to engaging in sex. Psychological barriers may also hinder some from engaging in sex after treatment. Among those who retained sexual activity, ways they did this included adaptation to less reliance on spontaneous erections and adapting their sexual activity to include a broader range of activities beyond intercourse. A key motivator appeared to be the importance of the relationship and intimacy with their sexual partner.

Another strong motivator that led to patients trying sexual management strategies was the extent of distress that sexual problems created. This finding is not totally surprising. Past studies [18, 19] had previously indicated that sexual dysfunction distress due to PCa treatment is one factor that leads patients to seek treatment. However, our finding that sexual function distress is associated with more strategies used, suggest that those patients are also likely to keep on trying different strategies until they can achieve satisfactory sex.

Less frequent relationship strain was also a predictor for patients seeking management strategies to help maintain sexual activity. This may be because relationship strains are linked to less frequent sexual activity in other populations too [20, 21]. Given that PCa treatment is likely to cause sexual dysfunction in men, relationship strain may occur post-treatment [12, 22]. For this reason, patient education plays an important role for couples who wish to remain sexually active post-treatment.

Other factors, such as patients' perception of the importance or ideal frequency of having partnered sex and communication with their partner about sex may influence willingness to try certain sexual management strategies. As previously noted [23], sexual help-seeking behaviour in PCa patients is associated with valuing sex as important to masculine identity. Based on our findings, patients whose ideal sexual frequency is high may potentially continue to seek ways to help them retain sexual activity.

Undoubtedly, sexual dysfunction affects not just patients, but also their intimate partners. Our qualitative analyses suggested that their partner's interest in continuing sexual activity and the ability of the couple to discuss options, were key factors in continued enjoyment of sexual intimacy. On the other hand, patients' willingness to try a strategy may not always align with their partners' willingness in trying the same strategy. Thus, what patients decide to try for sexual activity may require some negotiation with their partners.

Various factors are likely to affect patients' interest in trying a new device. Interest in less commonly recommended strategies was low in this study, mainly because patients found them unappealing. It also remains to be determined if their willingness may differ if their clinician is the one recommending the strategy. However, their clinician may not even be aware of these devices [11] as their effectiveness in helping couples maintain sexual activity has not been rigorously tested clinically. Furthermore, some are marketed as sex toys thus some people may not consider them as a medical treatment

Clinical implication

Our findings have important clinical implications for clinicians who are treating PCa patients. For example, prior to starting a treatment, they can educate patients and their partners about the potential sexual side effects of PCa treatment, and how to manage them. Such pre-emptive education may potentially alleviate sexual distress and relationship strains that the couples may otherwise experience.

Admittedly, clinicians themselves may experience barriers to discussing sexuality topics with their patients. In a recent study [24], lack of time, patient's reluctance and advanced stage disease are the three major factors that hinder uro-oncologists from discussing sexual dysfunction with their patients. That study also

suggested that dedicated sexual health support is needed to address sexual dysfunction that patients experience. Past studies have also shown that some clinicians feel embarrassed in discussing sexual topics with their patients [25, 26]. While we analysed communication with partner, we did not ask about patients' perception of their communication with their clinicians. Barriers in discussing sexuality topics may also potentially affect whether clinicians will refer patients to a specialist for sexual problems. In a recent study from the UK with over 30,000 participants [1], 56% of the participants were not offered any interventions for sexual problems. Future studies could potentially explore this aspect to get feedback from patients about discussing sexuality topic with their clinicians.

Future research on uncommonly prescribed devices, particularly on their effectiveness in helping patients and partners have satisfactory sex, is warranted because patients and partners preference can be diverse.

Limitation

This study has several limitations. Primarily, our use of online, convenience sampling means that we cannot determine whether our sample is representative of the population of PCa patients. Hence, we do not report prevalence data on the various strategies used, as they may not reflect the prevalence in the general PCa population. Associations between variables may be less likely to be influenced by lack of representative data; however, we note several aspects of our sample that may influence our findings.

In particular, the study participants were primarily Caucasian who had been in a long-term relationship with female partners. People of different ethnic or cultural background may have different openness in sexual devices for sexual activities. Interestingly, a recent study documented that gay and bisexual PCa patients were more likely to try some of the uncommonly prescribed strategies than heterosexual PCa patients [27]. Thus, there is a possibility that our findings may not be replicable in gay and bisexual men with PCa. Furthermore, most participants were well educated (>70% had university education). In another recent study, education levels appear to influence the choice of management strategies for sleep problems in PCa patients [28]. Thus, there is a possibility that our data may not be replicated in patients with lower educational background. In addition, online recruitment may have excluded participants unfamiliar with the internet and thus also less able to purchase sexual aids online.

Another limitation was that open text boxes allowed for some qualitative analysis but likely limited the depth of the responses. We recognise that in-depth interviews or qualitative surveys may provide a deeper understanding of men's thoughts and behaviours. Our survey also used no randomisation protocol.

Lastly, we acknowledge that we did not comprehensively include all available sexual management strategies. Future studies could also include questions about time after PCa diagnosis or after treatment, and sexual function status before diagnosis. Cancer stage is also another important variable that needs to be included in future studies because higher stage cancer is associated with poorer sexual outcomes [1], but unfortunately we did not collect this information. Such studies would also need to assess treatment modalities and psychological status of patients as these can influence sexual outcomes. Overall, these parameters may potentially influence their response to the openness to trying the various strategies.

CONCLUSION

In conclusion, various reasons may explain why patients seek more sexual management strategies following PCa treatment. Some of these reasons may relate to how distressed they are with sexual side effects, and relationship strains with their partners. When PCa patients seek advice for maintaining sexual activity,

clinicians ideally should have some knowledge on the variety of sexual management strategies that patients can use. In addition, they should advise patients to try strategies that both the patients and their partners are comfortable in using. They can also encourage patients and partners to maintain sexual intimacy, in a range of ways such as kissing, cuddling, mutual masturbation and oral sex. Restoring erection alone is unlikely to be sufficient for maintaining sexual activity, but a biopsychosocial approach is needed in this patient population.

DATA AVAILABILITY

Data are not archived in repositories.

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AUTHOR CONTRIBUTIONS

Conceptualisation: CD, CR, EW; Methodology: CD, CR, EW; Formal analysis and investigation: CD, KG, CR, EW; Writing—original draft preparation: CD, KG, CR, EW; Writing—review and editing: CD, KG, CR, EW; Funding acquisition: EW; Resources: EW.

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COMPETING INTERESTS

The authors declare no competing interests.

ETHICAL APPROVAL

The study protocol was approved by the University of Otago Human Ethics Committee (H18/107).

CONSENT TO PARTICIPATE

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

ADDITIONAL INFORMATION

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