

Telemedicine and prostate cancer survivorship: a narrative review

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Abstract: Prostate cancer survivors have unique needs that encompass diagnosis and treatment-related side effects. The provision of services for prostate cancer survivors is often limited by resources, time constraints in traditional clinic visits, payment, and patient and provider comfort with discussion of sensitive topics including sexual and urinary health, both of which are largely impacted by treatment. Telemedicine, the remote delivery of health care services using telephone, mobile, web, and video platforms, allows for potential cost savings, in addition to ease and comfort as patients can engage in telemedicine-based resources in the comfort of their homes. Furthermore, survivors prefer to seek information online making telemedicine approaches for prostate cancer survivorship care an ideal combination. A majority of the telemedicine-based interventions used the web, followed by telephone, mobile, and video platforms. In limited studies, telemedicine delivery of survivorship care has equal efficacy to traditional care delivery. In addition, although older patients did not use the Internet regularly, they were willing to adapt to Internet usage if it had the potential to increase their quality of life. Telemedicine delivery of prostate cancer survivorship care is acceptable, feasible, cost-effective, and potentially preferred by prostate cancer survivors. Additionally, it emphasizes knowledge, self-management and self-monitoring serving to increase self-efficacy. This specialized care allows for greater access and reaches a wider catchment area compared to traditional clinic visits. This is especially important as the number of prostate cancer survivors increases and healthcare systems incorporate alternatives to traditional in-person care.

Keywords: Prostate cancer survivorship; telemedicine; mhealth; ehealth

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Introduction

Advances in cancer detection, effective treatments, and increasing population longevity have increased the number of cancer survivors. In 1971, there were an estimated 3 million cancer survivors; in 2012 this number grew to 13.7 million (1). This trend is especially notable in prostate cancer, the leading non-cutaneous cancer among men, and their third leading cause of cancer death. It is estimated that by the year 2030, prostate cancer will be the most commonly diagnosed malignancy in North America (2). Men diagnosed with localized disease have an almost 100%

5-year survival rate. At 10 years, the relative survival rate is 98%, at 15 years, it is 91% (3). The man's average age at diagnosis is 67; average life expectancy after diagnosis is 22 years (4). Incident cases of prostate cancer increased 3.7 fold from 1990 to 2015 (5). With increased PSA testing, rates of detection have increased and prostate cancer survivors are being diagnosed younger and living longer (6). Most men diagnosed with prostate cancer choose to undergo treatment (7); therefore, the burden of treatment-related side effects is set to increase substantially as more men are diagnosed. It is important that the growing number of prostate cancer survivors have high quality care after

diagnosis and treatment to optimize quality of life.

With this in mind, combined with a call to action report from the Institute of Medicine (IOM), advancements in cancer survivorship care for prostate cancer have gained traction (8,9). Prostate cancer is unique in that it involves preference sensitive decisions. Treatments for localized prostate cancer, including expectant management (active surveillance, watchful waiting), radiation therapy, radical prostatectomy, and hormone therapy, have lasting impacts on sexual and urinary function, bowel function, psychological effects, and on relationships (10-12). These effects are often compounded by comorbid, preexisting illnesses and may impact survivor years after completion of treatment.

Given the growing unique needs for prostate cancer survivors, prostate cancer survivorship guidelines were established by the American Cancer Society (8). The guidelines address surveillance for prostate cancer recurrence, screening for second primary malignancies, assessment of physical and psychological short and long-term effects, as well as care coordination. As the population of prostate cancer survivors is increasing, their survivorship care requires support and services from multiple disciplines for which the healthcare system is underprepared at best.

There is evidence that survivors have increased information needs, as well as wish to access a wider range of supports and services after treatment (13,14). Moreover, the variety of unmet needs and needed services, at least in part, have led stakeholders to pursue survivorship care plans as coordinating support tools. Yet, variation in the distribution and supply of both human and infrastructure resources to meet survivorship care plan mandates makes them essentially ineffectual at this time, keeping resources out of the hands of survivors and their partners (15,16).

Telemedicine as a survivorship care resource

Telemedicine, also known as telehealth, e-health, and online/virtual health, is the remote delivery of health care services, clinical information, and in the case of cancer survivorship, coping strategies (17,18). Telemedicine has the potential to bridge gaps in survivorship care. As an alternative method for engagement in care via various technological platforms, it provides access to follow up and specialty care, regardless of geography, thus making up for the lack of local resources. In addition, prostate cancer survivorship care plans delivered via telemedicine platforms facilitate involvement of the partner in survivorship, which

can reduce psychological distress (19). Telemedicine-based survivorship tools can also monitor and provide follow up care, including symptom management and resource provision. Finally and in general, telemedicine applications offer easier communication and cost savings in many cases.

In this narrative review, we examine prostate cancer survivorship telemedicine interventions as a novel method to help support survivors and their partners.

Methods

We conducted a literature review to identify telemedicine-based interventions for prostate cancer survivors. In April 2018, we queried the PubMed database, using a combination of the following terms: prostate cancer, telemedicine, e-health, telephone, web-based, internet, follow-up, and survivorship. The primary search included prostate cancer and survivorship; this was done in order to ensure comprehensive inclusion of articles related to all telemedicine delivery platforms (web-based, telephone, video, mobile). The initial search resulted in 380 citations. After review, 358 articles were excluded by one or more of the following criteria: if the study was not telemedicine-based and if the study did not include prostate cancer survivorship. In addition, we used cited referencing to search other related articles leading to 2 relevant studies. At completion of review, 20 relevant articles were found (<http://mhealth.amegroups.com/public/system/mhealth/supp-mhealth.2018.09.08-1.pdf>). For this narrative review, telemedicine interventions were grouped based on mode of delivery.

Narrative review

Web-based interventions

We found that the majority of telemedicine-based survivorship care studies were web-based. These web-based interventions addressed self-management, symptom distress, self-efficacy, outcome measurement, patient knowledge, dyadic interactions between survivors and their partners, sexual recovery, and sexual satisfaction. Men generally seek information about the sexual side-effects of prostate cancer online and report the Internet as a preferred source of information about sexuality (20). This is important because most prostate cancer survivors are unsatisfied with their sexual outcomes (12,21,22). This positions web-based survivorship programs as a primary source of information

for some prostate cancer survivors.

Schover *et al.* studied the comparative effectiveness of an in-person and web-based intervention in providing support for sexual recovery of prostate cancer survivors and their partners through a randomized controlled trial (RCT). This study targeted issues that were based on findings from several studies: (I) focusing only on coping was largely ineffective in improving sexual function in men with prostate cancer (23,24); (II) men do not routinely use erectile aids after prostate cancer treatment (25,26); and (III) pilot interventions combining medical management of erectile dysfunction (ED) with sexual health counseling were associated with increased adherence and satisfaction (27,28). The intervention, offered to 115 heterosexual couples, provided counseling that encouraged the integration of effective ED treatments into couples' sexuality (29). Randomization included three groups: a 3 session face-to-face format, an internet based format, and a 3-month waitlist control. Longitudinal data demonstrated an improvement in erectile function for all participants. Men experienced improved IIEF scores if they had higher baseline marital satisfaction, younger female partner, partner with higher FSFI score, and if the man was using any ED treatment at 1 year. Marital happiness and overall distress did not change significantly across groups and were not correlated with using ED treatment. This study demonstrated that a web-based intervention could be a cost-effective, scalable method of providing sexual health support to prostate cancer survivors and their partners.

Another web-based resource, WebChoice, is an interactive health communication application for patients with breast and prostate cancer, which provides self-management, support and e-communication with nurses and other patients (30). An RCT assessed the effects of WebChoice on survivors with breast and prostate cancer. Of 325 breast and prostate cancer survivors, 163 were in the experimental group (66 prostate cancer patients) and 163 were in the control group (70 prostate cancer patients). The primary study outcome was symptom distress, which was measured at baseline, 3, 6, 9, and 12 months. Secondary outcomes included depression, self-efficacy, health related quality of life (HRQoL), and social support, which were measured at baseline, 3, 6, and 12 months. There was an insignificant trend towards less symptom distress in the intervention group. While there were no significant between group differences in the secondary outcomes, the survivors in the WebChoice arm had significant within group improvements in depression, while the control group had

significant within group declines in self-efficacy and quality of life. In addition, a separate analysis of patient email communication via the WebChoice platform also allowed patients to explore unmet questions and worries (31). Utilization was 77% and users had more computer experience. High users had high levels of symptom distress and depression (32). Education and income were not associated with use, which is consistent with prior studies on utilization and acceptance of web based health programs (33,34). Use was independent of age and previous computer usage; predictors of utilization included previous computer use and presence of additional comorbidities (35). The positive trends in the intervention group show that WebChoice can be helpful in survivorship care.

A feasibility study by Ashley *et al.* evaluated the collection of patient-reported outcomes in the electronic Patient reported Outcomes from Cancer Survivors (ePOCS) system (36,37). This study included 636 participants with non-metastatic breast, colorectal and prostate cancer diagnoses. For prostate cancer patients, sexual functioning was also assessed. Questionnaires were completed at 6 months (T1), 9 months (T2) and 15 months (T3) post diagnosis. Feasibility outcomes, including patient recruitment, response rate, retention, patient feedback, and administration burden were measured. ePOCS ran efficiently, and had few technical issues. Participation was 55% overall, questionnaire completion declined over time and was completed at all three time points by 57% of participants. Participant feedback showed that patients felt the intervention was easy to use and 86% reported they would use it long-term. Patients were more likely to fully complete the questionnaire at all time points if they were male, more affluent, were diagnosed with prostate cancer, and provided an email address. Older and less affluent patients were less likely to complete the assessment. This study showed that ePOCS can help address the challenge of routine collection of patient reported outcomes that are key to supportive care planning.

The Prostate Cancer Online Guide and Resource for Electronic Survivorship (PROGRESS) was developed to enhance patient knowledge, communication, health, and wellness by emboldening prostate cancer survivors to manage side effects of treatment and cope effectively (38). Miller *et al.* tested its usability and feasibility with 29 patients: 17 were involved in development and 12 tested usability. The framework of the PROGRESS website encompasses all domains of the American Cancer Society survivorship guidelines and is tailored to their preference for symptom

management. This program identified key concerns for prostate cancer survivors by eliciting them directly from the survivors. Semi-structured focus group and individual interviews were completed to elicit suggestions for content and feedback on the interface. Usability testing followed with the goal to determine the need for content and format modification of the website. The intervention was usable and survivors reported unmet needs that PROGRESS could alleviate such as managing side effects including fatigue and sexual dysfunction, as well as providing a tool to help with resolving psychological issues.

The FOCUS program (Family involvement, Optimistic attitude, Coping effectiveness, Uncertainty reduction, Symptom management) was originally a successful in-person program (39), which was transformed into a web-based format to allow for wider reach (40). The objective of this study was to examine the feasibility of translating the in person program into a web-based format and assess participant satisfaction. This intervention included 38 dyads and provided support for the dyadic interactions between patients and caregivers. Enrollment was 51% and retention rate was 86%. Primary outcomes included emotional distress and quality of life (QOL). Secondary outcomes included appraisal, coping resources, communication, social support, and self-efficacy. Dyads had decreased emotional distress, anger-hostility, and enhanced overall quality of life from pre to post-intervention. Partners had improved self-efficacy. A process evaluation showed that dyads found the program usable, useful, and were generally satisfied. As measured by enrollment and retention rates, the program was shown to be feasible. Interestingly, while the enrollment rate for the web-based program was lower (51%) than the enrollment for the original nurse-delivered program (68–80%), retention rate was higher in the web-based (86%) than the original nurse-delivered program (62–83%).

OncoActive is an intervention, which emphasizes the importance of self-management through physical activity in cancer survivors (41). It was tested in an RCT with 249 prostate and colorectal cancer survivors who received either print or web-based materials. The objective was to assess participants' characteristics as they related to delivery mode and utilization of the materials through a RCT. Survivors in the intervention received tailored physical activity advice at three time points, as well as a pedometer and interactive website access. Web and print based materials were provided to the intervention group. Most participants in the intervention group were classified as initial web-based participants (chose web-based materials over print) and used

web-based intervention materials. Dropout was lower in the web-based intervention group. Additionally, those who were less likely to start the web-based intervention were older, had longer time since treatment or completed treatment, and reported more fatigue. High utilizers of the web-based intervention had higher education and also completed treatment.

Enhanced Survivorship Care Plans (ESCP) is an intervention that was developed for prostate cancer patients in an intimate relationship and incorporated personal, couple and cancer related factors (42,43). It is based on a feasibility study of a web-based program called Prostate Cancer Education Resources for Couples (PERC) (43). ESCPs are a combination of survivorship care plans and PERC, with the goal of improving the quality of life for both patients and partners. In the published protocol, Song *et al.* describes a RCT, which is aimed at testing the feasibility and magnitude of benefit of ESCPs, using a mixed methods approach. Prostate cancer survivors will be randomly assigned to standard survivorship care plans or to ESCP. The outcomes will be to examine the feasibility of delivering ESCPs by enrollment and retention rates, program satisfaction and perceived ease of the ESCP. Data will be collected at baseline (T1) and 4 months (T2) among 50 patients who have undergone treatment for localized prostate cancer. The magnitude of the benefit of ESCPs will be estimated by comparing ESCP users to the standard survivorship care program users and assess primary and secondary outcomes of quality of life, improved self-efficacy and number of visits for care services.

The TrueNTH Sexual Recovery study is a web-based tailored intervention that supports the sexual recovery of men with prostate cancer and their partners (44). Wittmann *et al.* published their protocol for the testing of this intervention in an RCT. A multidisciplinary team of researchers, clinicians and prostate cancer survivors collaborated on its development. The inclusion of prostate cancer survivors as key stakeholders for the development of interventions is crucial for effectively addressing specific needs of cancer survivors. This intervention is personalized, based on partnership status, treatment type, and sexual orientation. Other interventions have been limited to heterosexual couples whereas this study also includes specific content for same-sex couples (45). A recent qualitative study on the lived experiences of gay and bisexual men with prostate cancer supports the inclusion of such specific content as gay and bisexual men found that they have unmet information and supportive care needs which negatively

impacts their quality of life (46). This study will respond to the call for individualized resources by sexual orientation which has been present in the prostate cancer literature since the early 2000s (47). This study will compare the effect of 6 modules, which address treatment-related sexual side effects and rehabilitation, psychological aspects of recovery and self-efficacy training, on patients' and partners satisfaction with their sex life between couples who receive the intervention and those who receive usual care.

As multidisciplinary expert support services for prostate cancer survivors are not available at every healthcare center, web-based prostate cancer programs can fill this gap. After initial investment, they are affordable and permit a cost-effective method of prostate cancer survivorship delivery (48). Remote prostate cancer survivorship can overcome barriers within the current healthcare system, such as access, patient time constraints, costs, and disclosure (49). As survivorship care plans continue to be developed in a web format, their advantage will be their ability to collect information, including web-based intervention results, and interact with survivors and providers in real time. One potential drawback of web-based programs is that some are not individualized and one size may not fit all (35). Understanding what survivors find useful is needed, so that utilization can be enhanced through responsiveness to survivors' preferences.

Telephone-based interventions in survivorship care

Telephone-based interventions, which allow healthcare providers or peers to verbally communicate remotely with caregivers and patients, have been shown to be as effective as usual care. Telephone-based interventions have the advantage of familiarity because healthcare professionals commonly communicate with patients and their families via telephone. There are different types of telephone interventions with different objectives. They either provide professional support and/or increase knowledge, self-management and self-efficacy.

In evaluating the effectiveness of telephone support, Chambers *et al.* compared telephone support to usual care in patients who underwent surgery for prostate cancer via a RCT (50). This study had three arms: peer telephone support, nurse telephone support, and usual care. Nurses or peer support volunteers delivered telephone support to 183 couples. The goal of this telephone support system was to evaluate psychosocial adjustment after diagnosis and treatment for prostate cancer. The outcomes of the study were sexual function and satisfaction, marital satisfaction,

self-esteem, sexual self-confidence, and sexual supportive care needs. Participants in the peer and nurse intervention groups were more likely to use medical treatment for ED when compared to those who received usual care. There were no effects of the intervention on sexual function, support needs, sexual self-confidence, self-esteem, and marital satisfaction. This study showed that telephone as a telemedicine delivery platform can be effectively utilized by professional experts as well as peers to improve patient outcomes in prostate cancer survivorship.

Mishel *et al.* conducted a randomized controlled trial where 239 prostate cancer survivors were randomized to either receive a psychoeducational intervention by phone with or without a close family member, or usual care (24). Men entered the study after surgical treatment or radiation and trained nurses delivered the intervention over an 8-week period. The objective of this study was to assess the efficacy of the telemedicine intervention on managing uncertainties of disease and treatment, which were the major outcomes measured. Men who received the intervention directly or supplemented by a family member improved in uncertainty management, cognitive reframing, and problem solving at 4 months. Focusing on this early time point proved to be most beneficial as the intervention provided needed support during the most intense time for treatment side-effects. The intensity of symptoms decreased over time for all groups. The intervention group also evidenced improved control in urine flow from baseline to 4 months. African American men in the intervention group showed significant improvement in sexual satisfaction from baseline to 4 months, but did not continue to improve from 4 to 7 months. This study demonstrated the importance of early intervention to alleviate distress due to post-operative incontinence and ED.

ProsCan evaluated the feasibility of peer-based telephone support in prostate cancer survivorship, designed to reduce survivors' distress (51). Ten prostate cancer survivors who were over 12 months post-treatment were peer support volunteers and twenty couples were included in the study. The telephone-based support led to survivors' psychological distress reduction. This intervention is currently being evaluated in an RCT.

In a pilot study of 40 prostate cancer survivors, Skolarus *et al.* demonstrated that interactive voice response (IVR) is a feasible, low cost method of assessing prostate cancer survivor quality of life (52). IVR is a low cost, automated telephone assessment system used to monitor symptoms and improve care by providing automatic feedback to patients

on the phone. The pilot study had 90% participation among men who were within 1 year of prostate cancer treatment and demonstrated feasibility for assessing prostate cancer survivor QOL. This pilot study data was leveraged to develop an intervention, which uses IVR to assess symptoms and tailor support materials to prostate cancer survivors. The intervention, “Building Your New Normal (BNN)”, is an RCT, which focuses on patient-reported outcome assessment, self-management support, and guidance for patients who receive care at Veterans Administration hospitals (53). IVR will be used for symptom assessment in prostate cancer survivors at several sites within the Veterans Administration system. Patients will be randomized to either an arm in which they will be able to choose which symptoms they wish to manage or to an arm in which they will receive general support for symptom management. Self-management guidance will be provided via newsletters. It will address both symptom management and coping skills building. Symptom burden will be evaluated at regular intervals. Primary outcome will be symptom improvement. Increase in coping skills will also be evaluated. The intervention will be assessed for efficacy and its potential for dissemination.

Telephone-based telemedicine interventions have several advantages. Patients who are not prone to utilize technology readily use telephones. In addition, like web-based survivorship programs, telephone-based interventions increase access to care and lower costs. The telephone-based interventions described above enhanced symptom self-management, a proven correlate of self-efficacy (54), through professional support, which has been shown to reduce objective caregiver burden (i.e., required tasks to care for the patient) (55). Telephone-based interventions hold much promise, but are not without limitations. Many include print based materials to accompany the phone system, which may prove cumbersome for patients and intervention providers. In addition, these interventions can impose time constraints, as patients have to be available at the time of the call unless it is an intervention where patients are able to call in at will.

Mobile applications

Mobile applications take advantage of smart phone technology and application platforms on these devices. Mitchell *et al.* showed that unlike access to laptops and tablet computers, the ownership of mobile phones is ubiquitous and not associated with income (56). This places mobile phones at an advantage compared to other modes

of delivery. Further support is demonstrated in a study by Wiseman *et al.* who showed that in a group of adults with mean age of 70, all respondents were willing to engage with their phones for health (57).

A prospective study enrolled 12 men in real time data collection using an electronic behavioral diary in the form of a handheld PDA with diary software (58). This study sought to evaluate the mechanism effect between coping and emotional outcome in men with prostate cancer. Participants in the study collected data for 1 month and were preempted to enter data 3 times per day. The response rate was over 90% for this study, supporting the feasibility and acceptability of electronic data collection methods for men with prostate cancer. Men also reported a lack of satisfaction with their support over time and social support constructs demonstrated variance over time. Though further refinement and testing is required, this can be incorporated into prostate cancer survivorship plans.

A 12-month mixed methods prospective study is underway to assess the utility of a mobile app, Ned, for prostate cancer survivors (59). A study protocol by Pham *et al.* describes Ned as a comprehensive mobile application, which is to be accessed by a patients' individual smartphone. It allows patients to check PSA values, record monthly functional and quality of life outcomes (59). Target accrual is 400 patients, 200 caregivers and 10 clinicians. Assessments will be done at baseline, 2 months, 6 months and 12 months. The outcomes of this study include: uptake, acceptability, effect of Ned on health-related quality of life, satisfaction with cancer care, unmet needs, self-efficacy, and prostate cancer-related levels of anxiety.

Many of the patients who utilized mobile devices for e-health had not used their devices for e-health interventions in the past, which supports mobile health as a telemedicine platform for prostate cancer survivorship. It also provides evidence for the possibility of a wide reach as more patients, particularly underserved patients, have higher use of mobile phones compared to other technology platforms.

Video-based survivorship care

Videoconferencing in the telemedicine setting for prostate cancer survivors is effective and can include healthcare providers such as urologists, nurses, psychologists, social workers, sexual health experts, and peers. In a study which evaluated the utility of video visits for 55 patients who underwent radical prostatectomy, patients were randomized

to outpatient follow-up visits and video visits with their urologist (60). This study found that both methods were equally efficacious and patients in both arms were equally satisfied. Patients in the video visit arm experienced cost savings.

Pain coping skills were successfully taught using video conferencing with patients coping with metastatic prostate cancer. Pain is related to increased psychological distress, decreased survival, and disability (61,62). Behavioral pain interventions, such as pain coping skills training (PCST) are not readily accessible as such training is usually only available through live interactions at major medical centers (63,64). Somers *et al.* sought to determine the feasibility and acceptability of a mobile pain management intervention—mobilePCST (mPCST)—in 25 patients, who lived up to 238 miles from the medical center, many in underserved areas (65). Videoconferencing with a licensed therapist resulted in 84% of participants completing the sessions and 67% reporting that they were very satisfied with the program. After the intervention, participants reported decreased pain severity and psychological distress. This study showed that mPCST was not only feasible, but also cost-effective and time saving.

Videoconferencing as a platform can be very effective for prostate cancer survivors, as patients are often cared for by multidisciplinary teams. An advantage of videoconferencing is patients' ability to enjoy face-to-face interactions while still having the ability to benefit from cost savings and wide reach. Support for videoconferencing in urology is noted in a study by Andino *et al.* which assessed video visits in outpatient urology settings and noted that patients across all age groups had high interest in video visits for urologic care. This finding is supported by others studies (66,67). Limitations include accessibility for patients who do not have access to devices that support videoconferencing.

Discussion

Prostate cancer survivorship requires ongoing multidisciplinary symptom management, psychological support and monitoring as 1 in 4 cancer survivors has a high symptom burden 1 year after diagnosis and treatment (62). Prostate cancer survivorship care is essential to prevent symptom neglect and poor coping. As specialized care for symptom management and patient and partner support is inconsistently available in traditional face-to-face encounters, telemedicine is emerging as a valuable resource that can be designed with expert and survivor input. The internet is now used

increasingly by cancer survivors (68,69). It has even been described as a preferred source of information for men with prostate cancer (20,70,71). Older patients are quite internet savvy. When prostate cancer survivors were asked in a survey, a majority (median age 70 years) were knowledgeable with respect to the Internet and were willing to access a web-based health record information system in place of meeting with a healthcare provider (72). Though the web appears to be the most utilized telemedicine delivery platform, telemedicine in its several formats, including mobile applications and video conferencing, have been shown to be a feasible, acceptable, and in many cases effective as an approach to address distress, symptom management, psychosexual issues, and other survivorship concerns They can be tailored to individual preferences and include partners whose wellbeing is critical to the wellbeing of survivors.

Telemedicine interventions in prostate cancer present opportunities and challenges (35). The opportunities lie in its ability to encourage survivor participation, reach the underserved who have high symptom burden and less access to healthcare because of lack of insurance, lower income, unemployment, and less education (3). Challenges lie in evaluating these systems to allow for practical implementation. Though utilization and efficacy of e-health interventions may be more prevalent in younger adults and require specific tailoring for older adults (73), it is important to recognize, based on evidence, that fears about older adults not being able to use web-based interventions are not warranted. A qualitative study by Heinz *et al.* evaluated perceptions of technology among older adults and demonstrated that older adults are enthusiastic about learning new technologies if these technologies have the potential to enhance their quality of life (74), which is the goal of cancer survivorship programs. As baby boomers were raised in the technology era, it is likely that age will no longer be a barrier to utilization. Further support is provided by a study by Movsas *et al.*, which showed that compared to paper forms, completion rate with a web based collection tool, the EPIC-26 in prostate cancer survivors was higher at 90% compliance at 6 and 12 months post treatment compared to 52% compliance for paper based forms (75).

Telemedicine has shown promise in managing a variety of symptoms, such as incontinence, sexual dysfunction, pain, and distress. Survivorship care plans, however, have not been successfully incorporated into the armamentarium of telemedicine. It may be that their complexity can be burdensome to patients and providers alike. It may also be that not including patients in their development means that

they are not sufficiently tailored to patients needs and are not user friendly (76).

Institutions and practices providing prostate cancer survivorship care should consider using telemedicine to expand their reach and improve their quality of care. By using telemedicine delivery tools, the survivor can be in a comfortable environment without the pressure and time constraints of a clinic visit. The survivor's costs of care can be also reduced. In addition, telemedicine allows for cost savings for the healthcare system through automation of expert self-management support. A comparative cost analysis by Zholudev *et al.* demonstrated considerable cost savings, up to 200 million per year with teleurology (77). A little discussed benefit of telemedicine may be its appeal to male patients who typically don't access healthcare as comfortably as women and who have been shown to "suffer in silence" in the prostate cancer survivorship period (78,79). This private way of seeking information and benefiting from interventions can provide specialized attention for concerns in prostate cancer survivorship that men may otherwise not seek.

Clinical implications

Telemedicine interventions for prostate cancer survivors in their various formats have demonstrated value for prostate cancer survivorship outcomes. They are especially advantageous for underserved populations, such as survivors for whom distance, cost, and time away from work can pose insurmountable barriers. For the healthcare system, telemedicine can also provide cost savings. Institutional and policy initiatives are needed to disseminate these specialized and personalized resources to cancer survivors, who have evidence of unmet needs, during critical time points in survivorship.

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Footnote

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