



# Exercise as a supportive care strategy in men with prostate cancer receiving androgen deprivation therapy at a regional cancer centre: a survey of patients and clinicians

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Received: 11 May 2021 / Accepted: 21 August 2021 / Published online: 14 September 2021

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## Abstract

**Purpose** To understand how frequently exercise is discussed and/or prescribed as a supportive care measure and the barriers and facilitators to exercise uptake for men with prostate cancer receiving androgen deprivation therapy (ADT) at a regional cancer centre.

**Methods** An observational, cross-sectional study was conducted at a regional cancer centre in three stages: (1) Retrospective chart review of men with prostate cancer undergoing ADT to identify the frequency of discussion and/or prescription of supportive care measures; (2) prospective patient survey exploring barriers and facilitators to exercise; and (3) prospective clinician survey exploring barriers, facilitators and awareness of exercise guidelines in men with prostate cancer.

**Results** Files of 100 men receiving ADT (mean age 73 years; mean ADT duration = 12 months) in the medical oncology ( $n = 50$ ) and radiation oncology ( $n = 50$ ) clinics were reviewed. Exercise was discussed with 16% of patients and prescribed directly to 5%. Patient survey ( $n = 49$ ). 44.2% of patients reported participating in exercise at a high level. Common barriers to exercise participation included fatigue (51.0%), cancer/treatment-related weakness (46.9%) and joint stiffness (44.9%). 36.7% of patients reported interest in a supervised exercise program. Clinician survey ( $n = 22$ ). 36.4% identified one or more exercise guidelines, and 40.9% correctly identified national exercise guidelines. Clinicians reported low knowledge of referral pathways to a supervised exercise program (27.3%). Clinicians believe physiotherapists (95.5%) are most suited to exercise prescription and 72.7% stated that exercise counselling should be part of supportive care. Limited time (63.6%) and patient safety (59.1%) were the two most common barriers to discussing exercise with patients. Clinicians reported that only 21.9% of their patients asked about exercise. The most endorsed facilitators to increase exercise uptake were patient handouts (90.9%) and integration of exercise specialists into the clinical team (86.4%).

**Conclusion** Despite a third of patient respondents indicating an interest in a supervised exercise program, only 16% of patients with prostate cancer undergoing ADT at a regional cancer centre engaged in a discussion about exercise with their treating clinicians. Physical limitations and fatigue were the greatest barriers for patients. Clinicians indicated a need for more clinician education and better integration of exercise specialists into clinical care. A tailored, integrated approach is needed to improve the uptake of exercise in men with prostate cancer.

**Keywords** Prostate cancer · Exercise · Androgen deprivation therapy · Supportive care

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## Introduction

Prostate cancer is the most common cancer in Australian men. With a 5-year relative survival of 95%, men with prostate cancer are living longer with the disease [1]. Despite overall advances in treatment and improvements in outcomes, it has been reported that men living in rural and regional areas face differentials in care including lower levels of PSA testing, higher stage disease at diagnosis, variations in access and use of prostate cancer-related services and increased mortality [2]. The 5-year relative survival for men with prostate cancer in rural and regional Australia is around 4% lower than their metropolitan counterparts [3].

Androgen deprivation therapy (ADT) is the gold standard for first-line treatment of locally advanced and metastatic prostate cancer [4, 5] but its use is associated with significant side effects. The toxicity of ADT includes changes in body composition impacting muscle strength, bone health, cardiovascular risk and aerobic fitness [6]. The use of ADT has an impact on sexual health and is associated with increased fatigue and possible adverse effects on mental health and cognition [7, 8]. While exercise is recommended for all patients diagnosed with cancer, it is particularly beneficial in men receiving ADT [6, 9].

## Benefits of exercise

Exercise has been shown to improve many aspects of the health of men with prostate cancer receiving ADT. Given this benefit and the relatively low risk of exercise, some advocates feel that exercise prescription should be a routine part of prostate cancer care [6].

The benefits of exercise can be seen across multiple health domains including physical function and mental wellbeing. A rapid review [10] provides strong evidence that exercise, for patients with prostate cancer receiving ADT, improves muscle mass [6] and strength, fatigue and physical function [11–13]. Moderate evidence supports the role of exercise in improving depression and anxiety [14], bone loss and sexual dysfunction in the same population [15].

## Patient barriers to exercise

Despite the established benefits of physical activity, there is considerable variability in the uptake of exercise interventions in men with prostate cancer undergoing ADT [15, 16]. Reported barriers to exercise participation include pain, fatigue and decreased motivation that some patients attributed to their ADT [17–20]. Patients also report barriers arising from other treatment modalities, including incontinence secondary to prostatectomy or radiotherapy [17].

## Clinician barriers

Clinician barriers to exercise prescription to men receiving ADT include fear of causing injury, time constraints and the perception that it was not the role of the oncologist to prescribe exercise [21–23].

## Facilitators

Facilitators of exercise uptake for men receiving ADT that have shown benefit include behavioural control strategies, tailored exercise programs and strategies to improve patient engagement [24, 25]. Increased patient engagement is also associated with a reduction in perceived exercise barriers [18]. The provision of individually tailored information improves uptake of physical activity as part of a healthy lifestyles program for cancer survivors [25]. Supervised, at home, and supported exercise programs are highly tolerable for men undergoing ADT, and result in sustained intention to exercise post intervention [26].

Teamwork between clinician and patient plays a significant role in improving exercise uptake. Randomised control trials have demonstrated that clinician referrals to exercise programs and the integration of exercise specialists into the treatment team significantly increased the uptake of exercise in men receiving ADT [27, 28].

The role of exercise as part of supportive care for men with prostate cancer receiving ADT should be the same regardless of where they live. Patients living in regional areas may face additional barriers such as the lack of subsidised exercise programs and an increased need to travel to access care. The rate of exercise recommendation as part of routine care in patients at a cancer centre in regional Australia is unknown but hypothesised to be low. Investigating the barriers and facilitators to the uptake of exercise in men receiving ADT living in regional Australia may inform the introduction of a formal exercise program.

## Research aims

Whilst the benefits of exercise for patients with prostate cancer has been well researched, the frequency of exercise discussion and prescription during patient consultations and the barriers and facilitators to exercise uptake in patients with prostate cancer remain largely unexplored, in a rural or regional context. This study aimed to explore the frequency that exercise as a supportive care strategy is discussed and prescribed in patients with prostate cancer receiving ADT in a regional cancer centre and the barriers and facilitators to exercise from both *patient* and *clinician* perspectives.

## Methods

An observational, cross-sectional design was employed in three parts: a retrospective analysis of current practice, and two prospective surveys ([Appendix](#) as Electronic Supplementary Material) identifying barriers and facilitators in patient and clinician populations. Ethics approval was gained through the Albury Wodonga Health Human Research Ethics Committee.

The study was conducted at the Albury Wodonga Regional Cancer Centre (AWRCC) in Albury, Australia. The AWRCC combines public and private health care delivering radiation and medical oncology services to a catchment population of over 250,000 people in rural and regional Australia [29]. Using the Australian Statistical Geography Standard-Remoteness Area framework the catchment of the health service is a mix of inner (ASGS-RA1) and outer regional (ASGS-RA2) [30]. Over 70% of the population of Australia resides in major cities (Remoteness area classification ASGS-RA0). The closest metropolitan centres to the AWRCC are Melbourne (320 km), Canberra (330 km) and Sydney (550 km). Patients with prostate cancer needing to see a urological oncologist are seen at another site. The AWRCC has limited supportive services staff, with no exercise specialists or gym facilities on site. General physiotherapy services are available at the adjacent public hospital but access is limited.

## Population selection

**Retrospective file analysis** Patients diagnosed with prostate cancer were included for analysis if they received ADT and were treated at AWRCC prior to 31 May 2018. This date was chosen to assess supportive care practices prior to the employment of a dedicated prostate cancer specialist nurse. A convenience sample of patients were selected consecutively backwards from that date in medical oncology clinics ( $n = 50$ ) and radiation oncology clinics ( $n = 50$ ), to a total of 100 patients.

## Prospective surveys

**Patient survey** Patients over 18 years old, with a diagnosis of prostate cancer, currently receiving ADT and receiving treatment at AWRCC were invited to participate if they were able to fill in a paper survey.

**Clinician survey** Clinicians involved in the care of patients with prostate cancer receiving ADT undergoing treatment at AWRCC were eligible to complete the survey.

## Retrospective review—classification of supportive care modalities

Individual patient electronic medical records were assessed for evidence of discussion or prescription of exercise and notation of supportive care in relation to the potential side effects of ADT. This included any discussion of bone health, cardiovascular complications, sexual health, fatigue, mental health, memory and cognition, mention of weight gain or sarcopenia.

Discussion or notation of exercise was defined as direct notation of exercise, assessment of exercise levels or prescription of an exercise plan.

## Prospective component—survey tools

The patient survey ([Appendix](#) as Electronic Supplementary Material) was constructed using multiple tools. Basic demographics and questions regarding interest in an exercise program were constructed by the researchers. Current self-reported general health was assessed using the EQ-5D-5L (5 items) [31]. Current exercise level was assessed by the IPAQ-SF self-administered survey (7 items) [32]. According to IPAQ guidelines, exercise level was converted into Metabolic Equivalent Time (MET) in minutes, and categorised into low, medium and high exercise categories. Exercise intention was assessed by questions, each rated on a 7-point scale from 1 (strongly disagree) to 7 (strongly agree). These items have indicated excellent reliability in previous exercise research among both undergraduate students [33] and cancer survivors [34, 35]. Barriers to exercise were assessed using a modified Perceived Exercise Barriers questionnaire (34 items) [36].

The clinician survey was adapted from a validated survey constructed by Nadler et al. [37]. Current exercise level of clinicians was assessed using the IPAQ-SF (7 items). Awareness of exercise guidelines (2 items) was modified to the Australian context by asking about Australian national guidelines rather than those from North America. The clinician survey included: Attitudes to the role of exercise in patients with cancer (8 items), extent of knowledge on managing exercise recommendations in patients with cancer (5 items), current practice in recommending exercise (10 items) and barriers and facilitators to discussing exercise with patients (25 items) ([Appendix](#) as Electronic Supplementary Material).

## Statistical analysis

As this study aimed to explore descriptive variables, all data were analyzed descriptively (using frequencies, percentages etc.). Frequency tables were developed to interpret results. Relationships between variables were not explored due to

the small sample size and exploratory nature of this research. Content analysis was used to interpret qualitative results. All analyses were conducted in SPSS Statistics for Windows, (Version 25.0. 2017 Armonk, NY: IBM Corp).

## Results

### Retrospective study

The retrospective analysis included a total of 100 patients seen in radiation oncology ( $n = 50$ ) and medical oncology ( $n = 50$ ) clinics between September 2017 and May 2018. Demographic details are included in Table 1. Patients had a mean age of 73 years and 71% had stage IV disease. Mean ADT duration was 12 months.

Evidence of discussion of exercise during patient consultations was recorded in 16% of patient files, with only 5% of files recording exercise being prescribed or recommended (Table 2). There was no difference in the characteristics in the patients with and without exercise discussion. The mean age (73 years) and tumour stage (Stage4) was the same in both groups.

Supportive care interventions relating to ADT side effects were recorded infrequently. Discussion about bone health occurred in 24% of patients, most commonly at the commencement of ADT. Bone strengthening with denosumab or bisphosphonates was discussed in 23%, and calcium or vitamin D supplementation in 20%. Fatigue (32%), hot flushes (33%) and weight gain (14%) were most commonly discussed after the initiation of ADT. Memory loss and or cognitive issues were discussed in 16% of patients, most commonly at the start of ADT (Table 2).

### Patient survey

The patient survey was completed by 49 patients, recruited between February and July 2019. The mean age of patients was 73 years and mean ADT duration was 38 months. Of note, 21/49 (42.9%) of patients completing the survey stated their level of education did not go beyond early high school (year 10) (Table 1).

As a rating of overall general health, the mean EQ-VAS score was 79.8 (range 25–100), with 0 being the worst health you can imagine and 100 being the best. Most frequently, patients reported problems with pain and discomfort (57.1%), mobility (42.8%) and usual activities (42.8%).

When questioned how many days of the week they would aim to exercise, patients reported a mean of 3 days per week. When asked if they intended to exercise ‘at least every other day’, 65.3% patients answered ‘slightly agree’ or higher. Utilizing the IPAQ-SF self-administered survey, 44.2% of

**Table 1** Basic demographics

Characteristic	Mean (SD, range) <i>n</i> (%)
Retrospective population. $n=100$	
Age (years)	73 (9.04, 55–93)
ADT duration (months)	12.64 (16.64, 1–87)
Stage	
Stage II	13 (13.0)
Stage III	16 (16.0)
Stage IV	71 (71.0)
Smoking status	
Ex-smoker	40 (40.0)
Smoker	11 (11.0)
Alcohol status	
Current drinker	61 (61.0)
Chemotherapy given	36 (36.0)
Radiotherapy given	74 (74.0)
Surgery given	43 (43.0)
Prospective patient population. $n=49$	
Age (year)	73 (7.87, 60–94)
ADT duration (months)	38 (55.53, 1–216)
Marital status	
Never married	1 (2.0)
Currently married	37 (75.5)
Separated	1 (2.0)
Divorced	7 (14.3)
Widowed	3 (6.1)
Residence type	
House/townhouse	45 (91.8)
Apartment	1 (2.0)
Retirement village/independent living unit	3 (6.1)
Level of education	
Early high school	21 (42.9)
High School (HSC/VCE or equivalent)	13 (26.5)
Technical college, TAFE, or apprenticeship	10 (20.4)
University degree (bachelor)	4 (8.2)
Higher degree (MD or PhD)	1 (2.0)
Prospective clinician population. $n=22$	
Age (years)	41 (11.44, 23–64)
Practice years	14 (11.78, 1–41)
Clinical role	
Medical oncologist	8 (36.4%)
Urologist	3 (13.6)
Radiation oncologist	2 (9.1)
Nurse/ nurse practitioner	8 (36.4)
Other	1 (4.5)
Gender – Female	10 (45.5)

ADT androgen deprivation therapy; SD standard deviation

patients reported a high exercise level, 25.6% a moderate level, and 30.2% a low level.

Patient-reported barriers to exercise are summarised in Table 3. The frequency tables suggest that prospective plans to exercise are most frequently negatively influenced by fatigue (51%), cancer or treatment-related weakness (46.9%) and cancer or treatment-related joint stiffness (44.9%). Only 6.1% of patients reported transport issues as a barrier to exercise uptake in general.

Content analysis of patient-reported interest in an exercise program demonstrates that 18/49 (36.7%) of the patients surveyed were interested in a tailored exercise program (Table 4), reporting social interaction and general health improvement as motivators. Of those who were unwilling or unable to participate in a formal exercise program ( $n = 30$ ), 9/30 (30%) cited transport issues as a reason and 8/30 patients (26.7%) stated that they were already doing enough exercise.

## Clinician survey

The clinician survey was completed by 22 clinicians from a wide range of disciplines (Table 1), in the period April to July 2019. Current level of exercise was also assessed using the IPAQ-SF tool and 63.6% of clinicians reported a high exercise level, 13.6% a moderate level, and 13.6% a low level.

Only 40.9% of clinicians correctly identified the national COSA guidelines for exercise in patients with cancer and

**Table 2** Supportive care discussion.  $n = 100$

Supportive care measure discussed	$n$ (%)	Exercise discussed $n$ (%)	Exercise not discussed $n$ (%)
Exercise	16 (16)		
Bone health			
At start of ADT	20 (20)	2 (2)	18 (18)
Post start of ADT	4 (4)	2 (2)	2 (2)
Memory and cognitive issue			
At start of ADT	16 (16)	16 (16)	0 (0)
Post start of ADT	6 (6)	6 (6)	0 (0)
Hot flushes			
At start of ADT	12 (12)	12 (12)	0 (0)
Post start of ADT	33 (33)	28 (28)	5 (5)
Fatigue			
At start of ADT	12 (12)	12 (12)	0 (0)
Post start of ADT	32 (32)	28 (28)	4 (4)
Calcium and/or vitamin D			
At start of ADT	10 (10)	3 (3)	7 (7)
Post start of ADT	10 (10)	0 (0)	10 (10)
Sexual health			
At start of ADT	10 (10)	2 (2)	8 (8)
Post start of ADT	4 (4)	1 (1)	3 (3)
Weight gain			
At start of ADT	8 (8)	8 (8)	0 (0)
Post start of ADT	14 (14)	12 (12)	2 (2)
Denosumab			
At start of ADT	7 (7)	1 (1)	6 (6)
Post start of ADT	16 (16)	2 (2)	14 (14)
Sarcopenia			
At start of ADT	3 (3)	3 (3)	0 (0)
Post start of ADT	6 (6)	4 (4)	2 (2)
Diabetes			
At start of ADT	2 (2)	3 (3)	0 (0)
Post start of ADT	0 (0)	4 (4)	0 (0)
Lipids			
At start of ADT	0 (0)	0 (0)	0 (0)
Post start of ADT	1 (1)	1 (1)	0 (0)
Cardiovascular disease			
At start of ADT	0 (0)	0 (0)	0 (0)
Post start of ADT	0 (0)	0 (0)	0 (0)

ADT androgen deprivation therapy

**Table 3** Patient barriers to exercise uptake.  $n = 49$ 

“Please indicate the extent to which you agree or disagree that each item could keep you from exercising during the next two months.”	Frequency $n$ (%)
Fatigue	25 (51.0)
Cancer or treatment-related weakness	23 (46.9)
Cancer or treatment-related joint stiffness	22 (44.9)
Other health problems besides cancer	21 (42.9)
Lack of motivation	21 (42.9)
Cancer or treatment-related pain	20 (40.8)
Other cancer-related symptoms or treatment side effects	19 (38.8)
Exercise not enjoyable	18 (36.7)
Cancer or treatment-related numbness or tingling	16 (32.7)
Weather conditions	16 (32.7)
Lack of interest	14 (28.6)
Cancer or treatment-related nausea	13 (26.5)
Fear of injury	12 (24.5)
Unpleasant sensation or symptoms caused by exercise	12 (24.5)
Lack of convenient facilities	11 (22.4)
Other preferences for leisure activities	11 (22.4)
Do not know how to exercise	10 (20.4)
Financial costs/fees	10 (20.4)
Having been diagnosed with cancer	10 (20.4)
Exercise not important to me	9 (18.4)
Fear of making other health problems worse	9 (18.4)
Doctor’s recommendation not to exercise	8 (16.3)
No instructor to guide me	8 (16.3)
Fear of making the cancer or treatment-related symptoms worse	8 (16.3)
Social of family responsibilities	8 (16.3)
Lack of equipment or proper clothing	7 (14.2)
Lack of time	7 (14.2)
Do not see the need to exercise	7 (14.2)
Lack of support from others	6 (12.2)
No one to exercise with	6 (12.2)
Embarrassment	4 (8.2)
Transportation problems	3 (6.1)
Lack of doctor’s permission	3 (6.1)
No safe place to exercise	3 (6.1)

Note: percentages indicate proportion of participants identifying the item as a barrier (i.e. rating higher than “not at all”)

36.4% reported familiarity with one or more exercise guidelines. All the clinicians surveyed disagreed with the statement ‘patients with metastatic cancer should not exercise’ and 81.8% disagreed that exercise will worsen cancer pain. In addition, 72.7% agreed that ‘exercise counselling should be a component of care that I provide’. Despite this, only 31.8% of clinicians reported adequate knowledge in counselling patients based on exercise guidelines and 27.3% stated they knew how to refer patients to a supervised exercise program (Table 5).

Clinicians were very likely to offer advice to ‘keep active, both during (86.4%) and after (95.5%) treatment’. On the other hand, clinicians were less likely to provide specific exercise guidelines or advice (27.3%) or refer to an exercise program (27.3%) (Table 5).

The barriers to the discussion of exercise with patients that clinicians most commonly identified included limited time (63.6%), patient safety (59.1%) and lack of knowledge of referral pathways (50.0%) (Table 6). Despite this, clinicians reported that exercise was safe for a mean of 71.6% of patients.

**Table 4** Endorsement of tailored exercise program. *n* = 49

Qualitative interview themes	Example	n (%)
Declined tailored exercise program		30 (61.2)
Distance or transport issues	“Too far to drive if in Albury.”	9 (18.4)
Already have adequate exercise levels	“I feel I do enough exercise.”	8 (16.3)
Other health problems	“Not mobile enough in my movements and a problem with my spine (lower) in relation to chronic back pain.”	5 (10.2)
Lack of interest	“Not interested.”	3 (6.1)
Not enough time	“I live on 2 acres, I’m too busy mowing, fencing, gardening.”	2 (4.1)
Endorsed tailored exercise program		18 (36.7)
Social interaction	“Whilst I enjoy maintaining a good level of fitness, doing so with others is better than doing it alone.”	4 (8.2)
Increase exercise levels	“Do not exercise at the moment but would like to.”	3 (6.1)
Improve cancer outcomes, or general health	“I am interested in all aspects of exercise as I believe exercise is the key to help keeping cancer at bay.”	3 (6.1)
Professional guidance	“Tailored exercise more beneficial to me monitored exercise. Motivation.”	2 (4.1)

The most commonly identified facilitators to a discussion of exercise were patient handouts (90.9%) and integration of exercise specialists into the clinical team (86.4%) (Table 6). Clinicians most commonly believed that physiotherapists (95.5%) and exercise physiologists (77.3%) were most suited to discuss exercise with patients.

Additionally, clinicians reported that a mean of 23.1% of patients ask about non-pharmacological methods to improve their cancer outcomes or reduce side effects of their treatment. Similarly, according to clinicians, only 21.9% of patients ask about exercise during or following cancer treatment.

## Discussion

### Offering exercise to patients

These results indicate that exercise was not routinely discussed as a supportive care strategy in men with prostate cancer receiving treatment at our regional cancer centre. Exercise was discussed infrequently (16%) and rarely prescribed (5%). Discussion about other aspects of supportive care such as bone health was documented, but this did not occur systematically. The clinician survey results suggest that most clinicians feel exercise should be encouraged, and at least 21% of patients ask about exercise during consultations. Given that almost 40% of patients expressed interest in a tailored exercise program, our data suggests that exercise provision is an unmet need in this population.

It is well established that ADT has significant side effects and that exercise can be used to manage and prevent ADT toxicity. The reason for the low rate of exercise prescription is multifactorial with patient and clinician factors playing a role. Part of this may be due to the lack of dedicated staff for

supportive care in rural locations. This places greater workload and time pressures for clinicians, which were identified as common barriers to exercise discussion.

Prescription or discussion of exercise did not seem to be influenced by advanced age, or advanced cancer stage. While these findings need to be validated with a larger cohort, the data does demonstrate that clinicians were not biased by their patients’ age or cancer progression. Despite this, there is no group specifically identified that could be targeted for exercise. Given that 13/22 (59.1%) clinicians felt that there were situations where exercise would be unsafe it is probably unrealistic to expect exercise to be discussed with all patients.

### Barriers to exercise uptake

Physical limitations and disease effects were major barriers to exercise uptake reported by patients. Fatigue and cancer-related weakness or joint stiffness were more commonly reported barriers than the fear of making cancer-related symptoms worse or logistical issues such as lack of time or equipment. Lack of motivation to exercise also ranked highly.

Transport was cited as a significant barrier in those who were unable or unwilling to participate in a formal exercise program. However, it was generally not perceived to be a barrier to exercise in general for the majority of patients. Reasons for this response would include a tolerance of travel required for treatment amongst regional patients or that exercise can be conducted at home. This finding informs various strategies to improve exercise implementation, such as having options of centre-based, telehealth and home-based programs, or incorporating exercise alongside clinical visits.

For the clinicians, time constraints were a major barrier to discussing exercise. Most clinicians report physiotherapists and exercise physiologists as the most appropriate clinicians

**Table 5** Clinician responses to exercise statements. *n* = 22

Statement	Agreed <i>n</i> (%)	Disagreed <i>n</i> (%)
Exercise counselling SHOULD BE a component of care that I provide.	16 (72.7)	3 (13.6)
There is observational evidence that moderate levels of exercise can decrease risk of recurrence in some disease sites – specifically breast and colon cancer.	10 (45.5)	4 (18.2)
Exercise counselling IS CURRENTLY a component of care that I provide.	10 (45.5)	9 (40.9)
There are hospital or community-based programs in my area that practitioners could refer patients to during or after cancer treatment.	9 (40.9)	7 (31.8)
My cancer centre offers written resources to keep patients active during of after cancer treatment.	7 (31.8)	7 (31.8)
Patients with cancer should avoid exercise when they have cancer related fatigue.	1 (4.5)	20 (90.9)
Exercise will worsen cancer pain.	0 (0.0)	18 (81.8)
Patients with metastatic cancer should not exercise	0 (0.0)	22 (100.0)
Extent of knowledge	Knowledgeable <i>n</i> (%)	Lacking knowledge <i>n</i> (%)
Know how to ENCOURAGE patients to participate in exercise when appropriate.	16 (72.7)	4 (18.2)
Know WHICH PATIENTS should be referred to a supervised exercise program.	12 (54.5)	4 (18.2)
Know WHEN (at which point during or after treatment) to counsel patients on exercise.	10 (45.5)	6 (27.3)
Know now to COUNSEL patients based on exercise guidelines.	7 (31.8)	6 (31.8)
Know HOW to refer patients to a supervised exercise program if necessary.	6 (27.3)	9 (40.9)
Likelihood of exercise implementation	Likely <i>n</i> (%)	Unlikely <i>n</i> (%)
Advise to ‘keep active’ AFTER treatment.	21 (95.5)	1 (4.5)
Advise to ‘keep active’ DURING treatment.	19 (86.4)	1 (4.5)
Discuss the role of exercise for cancer outcomes.	13 (59.1)	5 (22.7)
Discuss the role of exercise in symptom management.	12 (54.5)	2 (9.1)
Refer to an exercise program.	6 (27.3)	12 (54.5)
Provide specific exercise guidelines or advice.	6 (27.3)	13 (59.1)

to recommend and prescribe exercise to patients. Although clinicians perceived handouts to be the highest rated facilitator for exercise, the literature suggest that handouts have minimal effects on exercise uptake on their own [38]. However, the inclusion of exercise specialists has been shown in other studies to be an effective method for facilitating exercise uptake [27, 28] Overall, these findings suggest that physiotherapists or exercise physiologists should be included in the clinical team as specialists in exercise prescription and to help overcome the time constraint issues faced by other clinicians, thereby facilitating exercise uptake.

The population of men in the prospective cohort had a high median age (73 years) and 42.9% reported not gaining a formal education beyond year 10. Whilst this study did not specifically evaluate health literacy as a barrier to exercise uptake, it is a reminder that educational interventions need to be pitched appropriately.

### Clinician knowledge

The clinicians surveyed principally worked in cancer care and were motivated to discuss exercise with patients but reported a lack of specialised knowledge. Despite almost all clinicians reporting that they provided generic advice to “keep active”, less

than half could identify national guidelines on exercise, and the majority expressed low knowledge about exercise prescription. While clinicians estimated that 20% of patients ask about exercise, a higher proportion of patients expressed a desire to participate in an exercise program. Given that clinicians felt they had inadequate knowledge about recommending exercise and looked to others to refer, there is a need for clinician education and formal referral pathways. This conclusion is consistent with a recent scoping review and associated editorial [39, 40].

The data appear to suggest a discrepancy regarding knowledge of exercise safety among health care providers. All clinicians reported that patients with metastatic cancer should exercise, and 81.8% agreed that exercise would not worsen cancer pain. Despite this, 59.1% of clinicians reported patient safety as a barrier to exercise uptake. This indicates that there may be insufficient knowledge about the safety of exercise and education to increase understanding of patient safety is a potential means to improve exercise prescription.

### Regional context

Both patient and clinician barriers identified in this study are largely consistent with existing literature from metropolitan centres. This is promising for the implementation of tailored



**Table 6** Clinician identified barriers and facilitators by frequency. *n* = 22

Barrier	Frequency n (%)
There is limited time during a patient visit to discuss exercise	14 (63.6)
I feel that there are situations in patients that I treat where exercise would be unsafe	13 (59.1)
I do not have the knowledge on how or where to refer a patient to exercise	11 (50.0)
Patients have been told by other health care providers, friends, or family to rest	9 (40.9)
I know that a patient has refused other support services in the past	9 (40.9)
It feels futile to recommend exercise to a patient I know has a poor prognosis	7 (31.8)
My training does not qualify me to discuss exercise or refer to an exercise program	4 (18.2)
I am not convinced of the literature with respect to exercise and cancer outcomes	4 (18.2)
I do not know how soon post-surgery or post-radiation it is safe to exercise	4 (18.2)
I feel that referring a patient for exercise will make him/her feel guilty for not having done exercise prior to their cancer diagnosis	3 (13.6)
I perceive exercise to lack relevance to my patients' cancer or symptoms	1 (4.5)
I should only refer to an exercise program if a superior (i.e. consultant physician) asks this of me	1 (4.5)
<b>Facilitators</b>	<b>Frequency n (%)</b>
For this information to be available as a patient handout	20 (90.9)
Having an exercise physiologist or other exercise specialist available as part of the clinical team	19 (86.4)
Clinician education session about exercise in patients with cancer (indications, guidelines, referral process & safety information)	18 (81.8)
PAPER form/prescription pad with referral information	18 (81.8)
Email to practitioner with written information about exercise in cancer (indications, guidelines. Referral process. & safety information)	17 (77.3)
Posters for patients to see so they can ask about exercise of their own accord	16 (72.7)
For this information to be provided to patients at a different time than at physician visits	16 (72.7)
AUTOMATIC paper or electronic referral process	15 (68.2)
ELECTRONIC/WEB-BASED form/prescription pad with referral information	13 (59.1)
Having the support to refer a patient to an exercise program without a superior's direct request	12 (54.5)

Note: percentages indicate proportion of participants identifying the item as a barrier (i.e. rating higher than "Neutral")

exercise programs, as interventions developed in metropolitan centres may be applicable and have similar efficacy for our regional population.

Further research is needed to understand if discrepancies in the availability of exercise specialists between metropolitan, rural and regional centres impact exercise uptake for men undergoing ADT. The vacancy rate for allied health professionals such as physiotherapists and exercise physiologists in Victoria, for example, is significantly high, but more so for regional and rural areas [41]. The COVID-19 climate has seen the expansion of telehealth and online healthcare provision, and programs that offer at-home exercise support with online materials, such as The Man Plan ([www.themanplan.com.au](http://www.themanplan.com.au)), may alleviate this difference.

### Strengths and limitations

This study is one of the first to examine barriers and facilitators to exercise uptake in patients with cancer at a cancer

centre in a regional location. Therefore, the findings should be interpreted in the context of the limitations of this study.

The retrospective review of electronic medical records likely underestimated the frequency of supportive care interventions as it cannot account for verbal communication or handouts given to patients. Furthermore, in the surveys of patients and clinicians, the utilization of self-reporting could increase the likelihood of social desirability bias (36) and may lead to overestimation of exercise levels and exercise intention. Additionally, there may be some self-selection bias whereby participants who were more inclined to complete the survey may be more health-conscious and more likely to exercise. Furthermore, the small convenience sample size that was chosen reduced the ability to draw generalisable conclusions from the retrospective data alone and precluded further statistical analyses to be applied. The clinician survey of awareness of guidelines was modified for the Australian context, which may impact validity. However, the modifications of questionnaire wording were minor and we believe this may be a better gauge of Australian clinicians' attitudes and knowledge.

This study did not explore the impact of employing a prostate cancer specialist nurse to discuss exercise. Future research is needed to better understand the benefit of this role in the care of patients with prostate cancer undergoing ADT.

Despite these limitations, collecting both the retrospective and prospective data from different sources allowed for exploration and identification of variables that influence exercise uptake and potential strategies that may increase exercise uptake in this regional cohort.

Future research should explore the extent to which the variables identified in this study, such as discussion or prescription of exercise during patient consultations, influences the uptake of exercise in rural and regional cohorts. This would require a larger sample size which, due to smaller populations in rural areas, would potentially require the inclusion of several regional cancer centres.

## Conclusion

Exercise is routinely discussed in only a small proportion of men with prostate cancer receiving ADT at our regional cancer centre. Our study identified major barriers for patients (notably fatigue, physical limitations and motivation) and clinicians (notably time constraints, safety concerns, and low knowledge about exercise guidelines and referral pathways). These results suggest that exercise uptake may be facilitated by increasing clinician education, creating formal exercise programs and integrating exercise specialists into the clinical team. Our findings were largely consistent with studies conducted at metropolitan centres. The findings provide a platform for developing a tailored supportive care program for patients with exercise as a key component.

**Supplementary Information** The online version contains supplementary material available at <https://doi.org/10.1007/s00520-021-06512-2>.

**Acknowledgements** Thanks to the individual clinical teams at the Albury Wodonga Regional Cancer Centre: Border Medical Oncology and GenesisCare for allowing access to their electronic medical records.

Acknowledgements to Dr. Michelle Nadler for granting permission to use the exercise survey tool for clinicians.

**Author contribution** Conceptualization CS, HE. Methodology CS, HE, VO, WKS, AM. Data collection and analysis HE, AM. Writing HE, CS. Review and editing HE, CS, VO, WKS, MN, AM.

**Data availability** N/A

**Code availability** N/A

## Declarations

**Ethics approval** Trial approved by Albury Wodonga Health HREC ERM/4800 (AWHREC 442/18/9).

**Consent to participate** Informed consent gained from all participants.

**Consent for publication** Informed consent gained from all participants.

**Conflict of interest** Dr. Christopher Steer has received honoraria for advisory board membership and speakers' fees from Astra Zeneca, Glaxo Smith Kline, Specialised Therapeutics, Eisai, Janssen, MSD, Merck and Roche. HE, WKS, VO and AM declare no competing interests.

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