

ORIGINAL RESEARCH

A cross-sectional study evaluating the exercise discussion with oncologist during cancer consultation: the CONNECT study

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Background: Evidence demonstrates that physical exercise confers several psycho-physical benefits on patients with cancer. This study aims to investigate the role of oncologists in exercise promotion.

Patients and methods: A multicenter, cross-sectional study was conducted by distributing an anonymous, self-administered questionnaire to patients with cancer. The questionnaire enclosed demographic, health, and exercise variables. The exercise-related questions included in the study used the Godin-Shephard Leisure-Time Physical Activity Questionnaire to measure the amount of physical exercise. In addition, the survey gathered information on whether exercise was discussed with patients, and whether oncologists followed the assess, advise, reinforce, and refer (AARR) process regarding exercise. The survey also asked if patients preferred that exercise be discussed during their consultations. Descriptive statistics and logistic regression were applied.

Results: With a response rate of 75%, a total of 549 patients completed the survey. Regarding the exercise discussion, 38% of patients stated that their oncologist initiated an exercise discussion, 14% started the discussion themselves, and 48% said that the issue was not considered. Overall, 35% of patients reported that the oncologist assessed their exercise level, 22% and 42% received advice or reinforcement to increase their exercise, respectively, and 10% were referred to a dedicated service. Regarding preferences, 72% of patients thought that the oncologists should initiate an exercise discussion, 2% that only patients should start the discussion, and 26% thought that the issue should not be discussed. Similarly, 74% of patients are willing to receive the exercise assessment, 59% and 75% the advice and reinforcement to increase their exercise, and 46% to be referred to an exercise service.

Conclusions: Although exercise promotion rates are low, patients are willing to receive exercise information. Dedicated strategies should be developed to support oncologists in promoting exercise to their patients.

Key words: physical exercise, oncologist’s recommendation, cancer, quality of life, physical exercise recommendation

INTRODUCTION

Over the past three decades, physical exercise has gained attention for its potential as an adjunctive strategy in the cancer setting. A considerable body of observational studies supports the association between higher levels of physical

activity and lower risks of breast-, colon-, and prostate-specific mortality as well as all-cause mortality.¹ In addition, emerging evidence suggests improvements in survival for patients with lung cancer,² endometrial cancer,³ and for those undergoing immunotherapy treatment.⁴ Several randomized controlled trials strongly demonstrated the safety and feasibility of exercise intervention among the oncological population during anticancer treatments.⁵ Physical exercise has the potential to increase patients’ cardiorespiratory fitness,⁶ muscle strength, and mass,⁷ as well as to ameliorate some treatment-related side-effects, such as fatigue,⁸ lymphoedema,⁹ pain,¹⁰ peripheral neuropathy¹¹ and improve mood by decreasing anxiety and depression levels,¹² overall enhancing the quality of life.¹³

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Different scientific societies, such as the American College of Sports Medicine (ACSM),⁵ the American Cancer Society (ACS),¹⁴ and the American Society of Clinical Oncology (ASCO),¹⁵ have released physical exercise guidelines dedicated to patients with cancer. Despite the growing awareness, the large majority of the oncological population remains insufficiently active.^{16,17} As suggested by the ASCO guidelines, an effective exercise promotion requires a team effort, in which oncologists play a key role. Indeed, the oncologist may facilitate the adoption of a healthy lifestyle by reaching a high percentage of patients and enhancing the credibility of their recommendations.¹⁵ Among the modalities by which oncologists may be proactive in exercise promotion emerges the assess, advise, and refer (AAR) process.^{18,19} In ~5-min time, the oncologist may be able to assess the patient's physical exercise, recommend them to increase or maintain their physical exercise level, and refer the insufficiently active ones to a dedicated exercise service.^{18,19} In addition, some authors propose incorporating the reinforcement of the importance of physical activity engagement in the assess, advise, reinforce, and refer (AARR)⁴ process to make the clinician recommendation more effective.

However, beyond the AAR process, some investigations have been conducted to test the impact of oncologist recommendations on patients' physical exercise behavior. In this sense, a first randomized controlled trial on patients with breast cancer found that a 30-s recommendation led to a 30-min increase in moderate-intensity exercise compared with the control group.²⁰ Conversely, a second study conducted on patients with breast and colorectal cancer found that the oncologist's advice plus a motivational package was needed to improve exercise behavior, whereas the sole recommendation was insufficient to achieve significant enhancements.²¹ Finally, a more recent investigation, including >15 000 patients with colorectal cancer, reported that recall of discussion with the oncologist did lead to higher levels of physical activity.²² Overall, although the current data are not entirely conclusive, the available evidence suggests that it is likely that the oncologist's advice may play a role in promoting active behavior in patients.

Although some studies have investigated the exercise promotion practice from the perspectives of oncologists and healthcare providers,²³⁻²⁵ to our knowledge, just two studies have explored exercise promotion by the oncologists from the patient's perspective^{26,27} without deeply investigating the assess, advice, reinforce, and refer process. To fill this gap, we have designed the CONNECT study to determine (i) the percentage of patients with cancer who report being assessed, advised, or reinforced about physical exercise, and eventually referred to a dedicated exercise service/specialist; (ii) the percentage of patients who reported a physical exercise discussion with their oncologists, analyzing who initiated the discussion; (iii) the difference with other lifestyle behavioral practices promotion; (iv) the sociodemographic and medical determinants associated with the exercise discussion and the AAR process; and (v) the patients' preferences regarding the AAR process and exercise discussion.

MATERIALS AND METHODS

Study design and participants

The CONNECT is a cross-sectional study in which data were anonymously collected from February 2023 to February 2024 in three cancer outpatient facilities: the Oncology Unit at the University of Verona (Italy); the Oncology Department at San Luigi Gonzaga, Orbassano (Italy); and the Oncology Unit at the IRCSS National Cancer Institute, Bari (Italy). Patients were eligible if they were aged ≥ 18 years, had a cancer diagnosis, and had adequate Italian language proficiency in answering the questionnaire. The recruitment procedure was similar in the three centers. On randomly selected days, patients were approached face-to-face by the staff and informed about the study. If interested in participating, patients were asked to sign the written informed consent and then received a copy of the survey to return directly. To avoid duplication, the study staff systematically asked patients if they had already filled out the questionnaire. Ethics Committee approval was obtained from the University of Verona (Prot. No. 54507), Orbassano Hospital (Prot. No. 555), and IRCSS National Cancer Institute of Bari (Prot. No. 1311). The study was designed to adhere to Good Clinical Practice principles, and the procedures were conducted following the last revision of the Declaration of Helsinki as well as the Declaration of Oviedo. The current report is compliant with the Strengthening the Reporting of Observational Studies in Epidemiology (STROBE) guidelines.²⁸

Questionnaire

The self-administered questionnaire (Supplementary Material S1, Supplementary file 1 available at <https://doi.org/10.1016/j.esmooop.2024.103624>) was created after a literature review^{23,25,26,29} and revised by dedicated experts (oncologists, kinesiologists, psychologists, and representatives of patient advocacy) to develop the current version. The survey took ~25-30 min and was composed of 38 items divided into five sections: (i) general characteristics, (ii) exercise behavior, (iii) current and preferred exercise discussion, (iv) current and preferred clinical practice regarding exercise promotion, and (v) cancer diagnosis and treatment.

General characteristics were age (years), sex (male/female), weight (kg), height (m), educational level (elementary, up to age 10-11 years/secondary, up to 14 years/secondary, up to 18-19 years/college, university/postgraduate), marital status (single/married/divorced/widowed), occupational status (retired/homemaker/part-time employed/full-time employed), and perceived economic adequacy (inadequate/barely adequate/adequate/more than adequate). Weight and height were used to obtain body mass index according to the categories proposed by the World Health Organization (WHO).

Exercise behavior was explored using the Godin-Shephard Leisure-Time Physical Activity Questionnaire (GLTEQ).³⁰ The GLTEQ investigates the frequency of strenuous, moderate,

and mild activities. The Leisure Score Index (LSI) was calculated as the sum of [vigorous \times 9 metabolic equivalents (the metabolic equivalent of the task)] + (moderate \times 5 metabolic equivalents). LSI \geq 24 classifies a person as sufficiently active, that is, engaging in at least 150 min of moderate/strenuous exercise per week, as suggested by the guidelines of the ACS.¹⁴ In addition, two open-ended questions, adapted by Schmitz et al.,¹⁹ were used to explore the weekly engagement in aerobic and resistance activities. Patients who engaged in 90 min/week of aerobic exercise and at least two times per week in resistance activities were considered sufficiently active, according to the guidelines of the ACSM.⁵ These two methods to classify the lifestyle of patients with cancer were used to explore the impact of the different recommendations.

Current exercise discussion was investigated by asking patients ‘Was the exercise issue discussed at least once during a visit with your oncologist?’ (yes, the discussion was initiated by my oncologist/yes, the discussion was initiated by myself/no, it was not discussed).²⁶ The preferred exercise discussion was assessed with the question, ‘Would you have liked the exercise issue to have been discussed at least once during a visit with your oncologist?’ (yes, it should be initiated by my oncologist/yes, it should be initiated only by me/no, it should not be discussed).²⁶ To compare the current and preferred exercise discussion with other behavioral issues, the same two questions were repurposed for the following: psychological status, smoking habits, nutrition, weight control, and alcohol consumption.

Current clinical practice regarding exercise promotion was investigated by asking patients whether the oncologist has assessed their physical exercise (yes/no), advised them to increase/maintain an adequate exercise level (yes/no), reinforced the importance of physical exercise (yes/no), and referred them to a dedicated exercise service (yes/no), that is, the AARR process. The same questions were repurposed by asking patients whether they would have liked their oncologist to have assessed, advised, and reinforced the importance of physical exercise and referred them to a dedicated service.

The last section was dedicated to the self-reported medical variable, which enclosed cancer site (breast/lung/colorectal/upper gastrointestinal/head–neck/gynecological/urogenital/melanoma/other), disease status (early/advanced/metastatic/in remission or cured/unknown), date of diagnosis (month/year), type of treatment (surgery/chemotherapy/radiotherapy/hormone therapy/other), and current treatment status (about to start/ongoing/completed/not known).

Statistical analysis

Descriptive statistics are presented as mean, standard deviations, medians, and interquartile range for continuous data, and absolute counts and percentages for categorical data. A multivariable logistic regression model was applied to explore patients’ characteristics associated with current/preferred exercise discussion and current/preferred exercise

practice promotion. All variables were simultaneously considered in the model without any selection procedures, and odds ratios (ORs) and their 95% confidence intervals (CIs) were reported, with an OR $>$ 1.00 indicating a higher probability of exercise discussion/exercise practice promotion. All independent continuous covariates were transformed into categorical items to allow for a straightforward interpretation of ORs. IBM SPSS Statistics (version 28.0; IBM Corporation, New York, NY) was used to carry out the analysis.

RESULTS

A total of 732 patients were approached. Of these, 183 (25%) refused to participate and 549 (75%) completed the survey. Demographic and medical characteristics of the survey population are presented in [Table 1](#). Patients had a mean age of 63.5 (11.3 standard deviation) years, 53.9% were male, 69.6% were married, and 56.5% were retired from employment. The most frequent cancer types were lung (40.1%), followed by upper gastrointestinal cancers (31.0%); 32.2% had metastatic disease and 77.2% were still undergoing anticancer treatments.

Current and preferred exercise discussion

[Table 2](#) reports the current and preferred discussion with the oncologist about exercise and other behavioral issues. Regarding the exercise discussion, 38% of patients stated that it was initiated by the oncologist, 14% by themselves, and 47% indicated that the issue was not discussed. Compared with other behavioral issues, exercise was the second last to be discussed by the oncologist, but it was the second in terms of being initiated by the patients and the second to be not discussed. Regarding preferences, 72% of patients thought that exercise discussion should be initiated by the oncologists, 2% by the patients themselves, and 26% thought that exercise should not be discussed. With respect to other behavioral issues, exercise was listed as the fourth in terms of preference for oncologist-initiated discussion, the last in terms of being initiated by the patients themselves, and the third in thinking that it should not be discussed. [Supplementary Tables S1–S6](#), available at <https://doi.org/10.1016/j.esmoop.2024.103624> report the crossing between the current and preferred exercise and other behavioral practice promotion.

Current and preferred physical exercise practices promotion

Current and preferred exercise practices promotion are set out in [Figure 1](#). Overall, 35% of patients reported that the oncologist assessed their physical exercise level, 22% received advice to increase or maintain their exercise level, 42% stated that the oncologist reinforced the importance of being physically active, and 10% of patients were referred to an exercise service/specialist. Regarding the preferences for exercise practice promotion, 74% of patients thought that oncologists should assess their physical exercise level, 59% that they should advise patients to increase their

Table 1. Sociodemographic characteristics of the study participants	
Variable	Values
Sex, n (%)	
Female	253 (46.1)
Male	296 (53.9)
Age (years)	
Median/mean	65/63.5
Interquartile range/standard deviation	57-72/11.3
Body mass index (kg/m ²), n (%)	
<18.5	21 (3.8)
18.5-24.9	264 (48.1)
25.0-29.9	177 (32.2)
>29.9	81 (14.8)
Missing	6 (1.1)
Education, n (%)	
Elementary (up to 10-11 years of age)	62 (11.3)
Secondary (up to 14 years of age)	183 (33.3)
Secondary (up to 18-19 years of age)	217 (39.5)
College/university	67 (12.2)
Postgraduate	16 (2.9)
Missing	4 (0.7)
Marital status, n (%)	
Single	75 (13.7)
Married	382 (69.6)
Divorced	43 (7.8)
Widowed	37 (6.7)
Missing	12 (2.2)
Occupational status, n (%)	
Full-time employed	132 (24.0)
Part-time employed	36 (6.6)
Seeking employment.	16 (2.9)
Retired	310 (56.5)
Homemaker	52 (9.5)
Missing	3 (0.5)
Perceived income adequacy, n (%)	
More than adequate	89 (16.2)
Adequate	253 (46.1)
Barely adequate	149 (27.1)
Inadequate	40 (7.3)
Missing	18 (3.3)
Meeting the ACSM guidelines, n (%)	
Yes	49 (8.9)
No	491 (89.4)
Missing	9 (1.6)
Leisure Score Index (ACS guidelines), n (%)	
<24	505 (92.0)
≥24	34 (6.2)
Missing	10 (1.8)
Cancer site, n (%)	
Breast	49 (8.9)
Lung	220 (40.1)
Upper gastrointestinal area, n (%)	170 (31.0)
Genitourinary	24 (4.4)
Colorectal	40 (7.3)
Head and neck	12 (2.2)
Melanoma	9 (1.6)
Gynecological	4 (0.7)
Other	12 (2.2)
Missing	9 (1.6)
Cancer stage	
Metastatic	177 (32.2)
Advanced	126 (23.0)
Initial	61 (11.1)
In remission	81 (14.8)
Not known	81 (14.8)
Missing	23 (4.2)
Cancer treatment	
Surgery	199 (36.2)
Chemotherapy	360 (65.6)
Radiotherapy	140 (25.5)
Hormonotherapy	36 (6.6)
Other	136 (24.8)
	Continued

Table 1. Continued	
Variable	Values
Treatment status, n (%)	
Ongoing	424 (77.2)
Completed	70 (12.7)
Not yet started	19 (3.5)
Not known	21 (3.8)
Missing	15 (2.7)
Time from diagnosis	
Median/mean	14/28.8
Interquartile range/standard deviation	6-36/38.8

ACS, American Cancer Society; ACSM, American College of Sports Medicine.

exercise level, 75% believed that oncologists should reinforce the importance of being physically active, and 46% thought that oncologists should refer patients to a dedicated service.

Determinants associated with exercise discussion and exercise practice promotion

Table 3 displays the relation between the characteristics of patients with cancer and current and preferred exercise discussion. Compared with retired patients, those who have a part-time (OR 4.559, 95% CI 1.63-12.72; *P* = 0.004) and a full-time job (OR 2.024, 95% CI 1.06-3.88; *P* = 0.034) are more likely to report an exercise discussion with their oncologist, as well as those who had a lung cancer diagnosis (OR 3.508, 95% CI 1.36-9.05; *P* = 0.009), with respect to patients who have breast cancer. The engagement of patients in physical exercise was not significantly associated with the exercise discussion with their oncologist.

Regarding the preference, with respect to those who attended a secondary school up to 14 years of age, patients with a higher education level (OR 1.778, 95% CI 1.06-2.99; *P* = 0.030) were more likely to want a discussion about exercise with their oncologists, as well as those who have a part-time job (OR 17.786, 95% CI 2.18-145.03; *P* = 0.007), than those who are retired.

Determinants associated with preferred exercise discussion and exercise practice promotion

Logistic regression associating characteristics of patients with the current and preferred AARR process is shown in supplementary Tables S7-S10, available at <https://doi.org/10.1016/j.esmoop.2024.103624>. Among the most striking findings, current assessment, advice, and reinforcement practice are significantly associated with lung and urogenital cancer diagnosis. The current referral practice to a dedicated service/specialist is associated with an early stage of disease (OR 5.167, 95% CI 1.27-21.04; *P* = 0.022) and with surgical treatment (OR 2.507, 95% CI 1.05-5.99; *P* = 0.039), and inversely related to chemotherapy treatment (OR 0.403, 95% CI 0.17-0.97; *P* = 0.043). Preference to referral is related to surgical treatment (OR 1.881, 95% CI 1.14-3.11; *P* = 0.014) and inversely related to lung cancer diagnosis (OR 0.341, 95% CI 0.13-0.78; *P* = 0.025).

Table 2. Current and preferred exercise and other behavioral issues discussed during the visits

	Current discussion			Preferred discussion		
	Oncologist-initiated discussion, n (%)	Patient-initiated discussion, n (%)	Not discussed, n (%)	Oncologist should initiate discussion, n (%)	Patient should initiate discussion, n (%)	Should not be discussed, n (%)
Physical exercise	202 (38)	76 (14)	250 (47)	349 (72)	12 (2)	124 (26)
Psychological issue	232 (45)	62 (12)	216 (42)	358 (75)	46 (10)	76 (16)
Tobacco smoking	247 (49)	15 (3)	237 (47)	309 (67)	28 (6)	126 (27)
Nutrition	297 (59)	88 (17)	122 (24)	422 (86)	34 (7)	34 (7)
Weight control	345 (68)	41 (8)	118 (23)	417 (85)	34 (7)	40 (8)
Alcohol consumption	189 (37)	19 (4)	298 (59)	303 (64)	24 (5)	143 (30)

DISCUSSION

The CONNECT study found that about one-half of patients with cancer reported having had an exercise discussion with their oncologist, whereas a low rate of patients have received the AARR process.

In this study, exercise was discussed with the oncologist in ~52% of patients with cancer, and specifically, 38% of patients reported an oncologist-initiated discussion and 12% a patient-initiated discussion. Our findings are slightly lower with respect to the investigation of Martinez Aguirre-Betolaza et al.,²⁷ who reported an overall exercise discussion in 62%, but higher compared with that of Jones et al.,²⁶ who found that exercise discussion was initiated by oncologists for 28% of patients and by the patients themselves in 14% of cases. Conversely, whereas in the study of Jones et al.,²⁶ 82% of patients preferred that exercise discussion would be initiated by the oncologist and 15% by the patients themselves, in the CONNECT study, the preferences for an oncologist- and patient-initiated exercise discussion were 71% and 2%, respectively. Only a few sociodemographics and medical variables were associated with the current and preferred exercise discussion, indicating that oncologists are not influenced by these features when discussing exercise, and similarly, the willingness of patients to exercise

discussion is not impacted by their disease and socio-demographic background. Of note, patients with lung cancer were more likely to have an exercise discussion with their oncologists. This finding is likely to be related to the specific thoracic malignancies-oriented expertise of the involved centers, as well as to the presence of a dedicated exercise program in Italy for patients affected by lung cancer, supported by WALCE (Women Against Lung Cancer in Europe).³¹

On the one hand, the results of preference indicate that patients generally accept the exercise information and expect the oncologist to introduce the topic. On the other hand, the data regarding the current exercise discussion, particularly in comparison with other behavioral issues (such as nutrition), underline that exercise promotion is still deprioritized. With these findings and considering that engagement in physical exercise may confer clinically meaningful benefits, including a potential increase in survival,¹ exercise promotion becomes crucial in clinical routine, with the oncologist being a key player.^{20,21}

In the CONNECT study, patients reported that the oncologists assessed their physical exercise level in 35% of cases, advised their patients to increase/maintain their exercise level in 22%, reinforced the importance of exercise in 42%, and 10% referred to an exercise service/specialist.

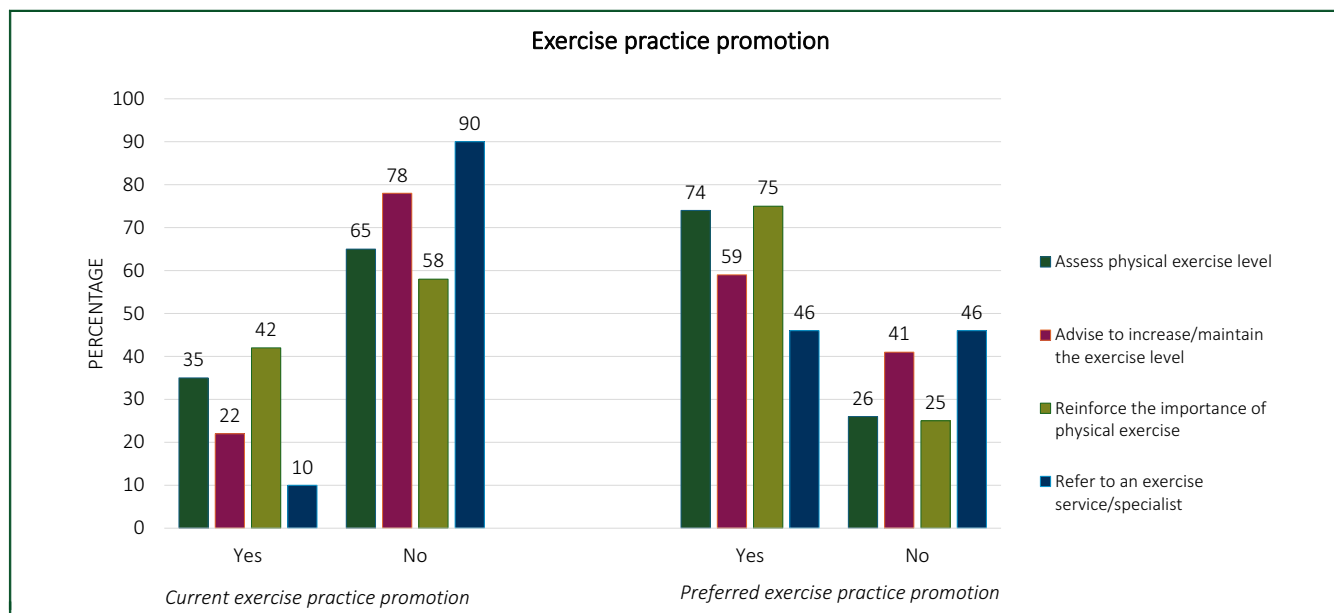


Figure 1. Current and preferred exercise practice promotion among oncologists.

Table 3. Association of current and preferred exercise discussion in patients with cancer^a

	Current exercise discussion ^b			Preferred exercise discussion ^b		
	OR ^c	95% CI ^c	P value ^c	OR ^c	95% CI ^c	P value ^c
Sex						
Female (reference)	1.000			1.000		
Male	1.562	(0.93-2.61)	0.089	1.709	(0.97-3.01)	0.064
Age (years)						
<65 (reference)	1.000			1.000		
≥65	1.025	(0.58-1.82)	0.933	1.339	(0.73-2.45)	0.344
Body mass index (kg/m²)						
Underweight (reference)	1.000			1.000		
Normal weight	1.929	(0.57-6.51)	0.290	0.804	(0.22-2.92)	0.741
Overweight	2.350	(0.67-8.20)	0.180	0.656	(0.17-2.47)	0.532
Obese	2.313	(0.62-8.61)	0.211	1.724	(0.40-7.37)	0.463
Education						
Up to age 14 years (reference)	1.000			1.000		
Beyond age 14 years	1.377	(0.86-2.20)	0.179	1.778	(1.06-2.99)	0.030
Marital status						
Married (reference)	1.000			1.000		
Single	0.643	(0.33-1.25)	0.194	1.151	(0.51-2.60)	0.735
Divorced	0.950	(0.44-2.08)	0.898	1.013	(0.42-2.46)	0.978
Widowed	0.759	(0.29-1.97)	0.572	0.638	(0.23-1.75)	0.383
Occupational status						
Retired (reference)	1.000			1.000		
Homemaker	1.150	(0.49-2.68)	0.746	0.888	(0.36-2.18)	0.796
Part-time	4.559	(1.63-12.72)	0.004	17.786	(2.18-145.03)	0.007
Full-time	2.024	(1.06-3.88)	0.034	2.036	(0.99-4.17)	0.052
Other	1.438	(0.36-5.71)	0.606	6.430	(0.70-59.01)	0.100
Income adequacy						
Inadequate (reference)	1.000			1.000		
Adequate	0.927	(0.58-1.48)	0.751	0.860	(0.51-1.45)	0.569
Physical activity frequency						
<1 time/week (reference)	1.000			1.000		
1-2 times/week	1.551	(0.90-2.68)	0.115	1.758	(0.94-3.28)	0.076
>2 times/week	1.713	(0.99-2.94)	0.050	1.059	(0.59-1.91)	0.848
Tumor site^d						
Breast (reference)	1.000			1.000		
Lung	3.508	(1.36-9.05)	0.009	0.623	(0.20-1.94)	0.414
Colorectal	2.308	(0.74-7.25)	0.152	1.190	(0.27-5.30)	0.820
Upper gastrointestinal area	0.982	(0.39-2.46)	0.969	0.776	(0.25-2.37)	0.656
Urogenital	2.322	(0.61-8.90)	0.219	0.479	(0.10-2.30)	0.358
Other	0.765	(0.23-2.53)	0.660	0.406	(0.10-1.67)	0.211
Stage of disease						
Remission (reference)	1.000			1.000		
Early	1.135	(0.48-2.70)	0.775	1.753	(0.62-4.96)	0.290
Advanced	0.602	(0.28-1.28)	0.188	0.612	(0.26-1.46)	0.270
Metastatic	0.677	(0.34-1.36)	0.272	0.696	(0.31-1.58)	0.385
Unknown	0.569	(0.25-1.28)	0.174	0.546	(0.21-1.40)	0.207
Chemotherapy						
No (reference)	1.000			1.000		
Yes	0.892	(0.51-1.56)	0.687	0.864	(0.46-1.61)	0.647
Surgery						
No (reference)	1.000			1.000		
Yes	0.851	(0.50-1.44)	0.548	1.348	(0.74-2.47)	0.335
Radiotherapy						
No (reference)	1.000			1.000		
Yes	1.209	(0.72-2.04)	0.475	1.007	(0.56-1.81)	0.982
Hormonotherapy						
No (reference)	1.000			1.000		
Yes	1.071	(0.42-2.76)	0.888	2.458	(0.67-8.98)	0.174
Other therapies						
No (reference)	1.000			1.000		
Yes	0.774	(0.417-1.43)	0.415	1.410	(0.72-2.76)	0.315
Adherence to guideline						
No (reference)	1.000			1.000		
Yes	1.221	(0.55-2.71)	0.624	1.471	(0.58-3.6)	0.420

Continued

	Current exercise discussion ^b			Preferred exercise discussion ^b		
	OR ^c	95% CI ^c	P value ^c	OR ^c	95% CI ^c	P value ^c
Leisure Score Index						
<24 (reference)	1.000			1.000		
≥24	1.415	(0.55-3.68)	0.476	1.002	(0.34-2.99)	0.997
Time from diagnosis						
≤30 m (reference)	1.000			1.000		
>30 m	1.295	(0.78-2.15)	0.315	1.021	(0.58-1.80)	0.942

CI, confidence interval; OR, odds ratio.

^aCurrent and preferred exercise discussion classified as yes, oncologist-initiated discussion/yes, initiated by me versus no.

^bEach variable was mutually adjusted for the following variables if not otherwise specified: sex (male, female); age (<65 years versus ≥65 years); education (≥high school versus <lower than high school); patient's address (outside the city, city dweller); perceived income adequacy (adequate versus nonadequate); marital status (married, unmarried, divorced, widow); occupational status (retired, stay at home, part-time employed, full-time employed, other); frequency of sweating-inducing activity (<1 time/week; 1-2 times/week; >2 times/week); adherence to guidelines (yes versus no); Leisure Score Index (<24 versus ≥24); tumor site (breast, lung, colorectal, upper gastrointestinal area, urogenital, other); stage of the disease (remission, early, advanced, metastatic, unknown); chemotherapy (yes versus no); surgery (yes versus no); radiotherapy (yes versus no); hormone therapy (yes versus no); other treatments (yes versus no); treatment status (ended, incoming, ongoing, undefined); time from diagnosis (≤30 months, >30 months).

^cOR and CI and P value from the logistic regression model.

^dTumor sites with <10 patients are classified as 'other'.

and referred patients to an exercise service in only 10% of cases. Studies among oncologists and healthcare providers reported similar or slightly higher rates of assessment (63%-78%), advice (38%-72%), reinforcement (43%-80%), and referral (10%-23%).^{25,29,32} A certain degree of discrepancy could be related to the geographical location in which the surveys were conducted: investigations implemented in North America or Australia^{29,32} show higher frequencies of the AARR process, whereas, in Europe, the reported data are generally lower.²⁵ Besides, in the CONNECT study, the oncologist practice for assessing, advising, and reinforcing has been found to be associated with lung and urogenital cancer diagnosis, whereas the referral was associated with early stage of disease, surgery, and inversely related to chemotherapy treatment. This observation suggests that oncologists may be more proactive in promoting exercise to patients affected by certain cancer types than others and that they refer to an exercise service those patients with an early stage of disease who consequently have a low burden of symptoms. However, because the literature clearly highlights the importance and the psycho-physical benefits of physical exercise across the different cancer types^{1,2,5,33} and stages, including those with metastatic cancer,³⁴⁻³⁶ it becomes essential to promote physical exercise in the oncological population in the wide sense of the term.

Among the possible barriers related to the low rate of the AARR process and its medical determinants, inadequate training in exercise counseling is frequently reported,²⁵ suggesting that more education about physical exercise is needed for healthcare providers. For this purpose, the recent guidelines about survival,¹ benefits, and amount of physical exercise⁵ and instructions to implement the AARR process¹⁹ provided by the ACSM may help train healthcare providers and offer dedicated tools to promote physical exercise among patients, especially in regions such as Europe, where the AARR appears less applied. The very low rate of referral (10%) that was observed is likely to be related to the scarcity of dedicated services, which may induce clinicians to

approach rationally the available resources favoring those patients with an expected better disease trajectory. Overcoming the lack of dedicated exercise services is crucial to improving exercise promotion. For this reason and to support clinicians in the referral practice, the ASCM has launched a worldwide registry, including >1.722 exercise programs specifically designed for patients with cancer.³⁷

Limitations of this study should be noted. Despite the effort to have a representative large sample, a possible source of error could be the selection bias because it is possible that those who have participated in the CONNECT study are mainly those patients more interested in physical exercise. Moreover, as many associations have been assessed and no multiple testing adjustments have been applied, some significant results may be due to chance. Further, in this study, information regarding patients' conditions, such as the presence of comorbidities, as well as the patient's lifestyle habits beyond physical exercise, was not collected. Such information could influence patients' responses and attitudes toward recommendation prescription; future studies should clarify this point.

Conclusions

The CONNECT study highlights that the current status of exercise discussion and promotion with oncologists in clinical practice, according to the AARR process, still needs profound improvements. The good news is that patients are interested in receiving exercise information and believe the oncologist should make the first move in exercise promotion.

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DISCLOSURE

The authors have declared no conflicts of interest.

DATA SHARING

Data related to this study are available from the corresponding author.

ETHICS APPROVAL

All patients provided informed written consent before enrollment in the study. This study was approved by the Ethics Committee of the University of Verona (Prot. No. 54507), Orbassano Hospital (Prot. No. 555), and IRCSS National Cancer Institute of Bari (Prot. No. 1311).

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