

Exercise in lung Cancer, the healthcare providers opinion (E.C.H.O.): Results of the EORTC lung cancer Group (LCG) survey

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ABSTRACT

Objectives: Exercise has been reported to alleviate disease as well as treatment impact in patients with lung cancer. Nevertheless, there is limited information available regarding the perception of lung cancer dedicated healthcare professionals' and their advice on exercise.

Materials and Methods: An online survey exploring healthcare professionals' practice patterns, perceptions, barriers, and facilitators of exercise in patients with lung cancer was conducted within members of the EORTC Lung Cancer Group (LCG).

Results: One hundred forty-one healthcare providers completed the survey, mainly medical and radiation oncologists. Overall, 63% of the study participants declared that they frequently assessed exercise level in their patients, and 43% of them reinforced the importance of exercise. However, only 10% referred patients to an exercise program or specialist. Although the majority of the respondents had a positive perception regarding the

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benefits and safety of exercise (even in patients with advanced disease and/or bone metastasis), two-thirds of clinicians reported not having adequate training about exercise counselling. Moreover, 53% reported to lack of knowledge of guidelines referring to exercise in patients with cancer. Several obstacles and facilitators to improve exercise promotion in lung cancer care were identified.

Conclusion: Healthcare providers recognize the relevance and feasibility of exercise as part of cancer treatment intervention, but specific pathways to do the referral are frequently missing. Future structured and well-designed strategies and initiatives are needed to support an effective referral in order to implement exercise interventions routinely in clinical practice.

1. Introduction

Lung cancer remains a significant cause of mortality and morbidity, with an estimated numbers of 1.2 million people worldwide living after a lung cancer diagnosis in 2020 (1-year prevalence) [1]. The advent of innovative treatments, such as immunotherapy and targeted therapies, has improved patients' outcome at different stages of the disease [2]. Nevertheless, the quantitative prognostic benefit may be accompanied by cancer- and treatment-related acute and long-term morbidities, as well as severe physical and psychosocial side effects, potentially harming patients' quality of life [3]. Several studies have explored exercise as supportive therapy following a lung cancer diagnosis [4]. The evidence states that exercise is beneficial for patients with lung cancer. In the early disease stage, post-operative exercise may increase patient's exercise capacity [5], muscle strength [6], quality of life [5], and manage some side effects, such as fatigue [7], sleep disorders [8], anxiety/depression [9], and dyspnea [5]. Although the literature is limited, in patients with advanced disease stage, exercise has been shown to be safe, feasible [10], and able to increase or maintain strength [11], as well as to improve emotional and psychological wellbeing [11]. Nevertheless, no definitive evidence are available so far correlating postdiagnosis physical activity and survival in lung cancer [12]. For over a decade, international societies have been supporting the role of exercise in cancer care [13–18]. However, despite the benefits and the recommendations, most patients with lung cancer result insufficiently active [19,20].

Patients with lung cancer are willing to receive advices and recommendations about exercise [21], in most of the cases from their physicians with a face-to-face approach [21]. Healthcare providers may actually play a fundamental role in enhancing both exercise quantity and quality in their patients. In this sense, a single-blinded randomized controlled trial found that oncologist's suggestion for exercise combined with an exercise motivation package, including a DVDs, a pedometer, a diary, and 15 min of education session, was effective in increasing exercise level in patients with breast and colorectal cancer [22]. Similarly, another investigation reported that oncologist's recommendation to exercise in addition to cancer-specific, yoga-based DVD was able to reduce fatigue levels in patients with breast cancer [23].

From the healthcare providers' perspectives, only few reports investigated their opinions about exercise recommendation and factors associated with exercise promotion in cancer care [24–26]. A previous study reported that 46% of oncology care providers regularly promoted physical activity and 23% referred patients to an exercise specialist [27]. Several factors may influence exercise promotion, such as lack of time, lack of access to trained specialists [27], as well as their exercise level [28]. Indeed, physically active oncology care providers seem to be more likely to recommend exercise to their patients [28]. Nevertheless, to the best of our knowledge, investigations exploring attitudes, practice, as well as barriers and facilitators of exercise promotion, specifically designed for oncology care providers working in lung cancer setting, are missing. In order to bridge this gap, the ECHO (Exercise in lung Cancer: The Healthcare providers Opinion) survey was designed with the following aims: (i) understand the assessment of exercise in the current lung cancer clinical practice; (ii) identify the knowledge about exercise guidelines for patients with lung cancer; (iii) examine clinicians'

perceptions, barriers, and facilitators to promote exercise in patients with lung cancer, and (iv) examine the oncology providers' characteristics associated with exercise assessment.

2. Materials and methods

2.1. Study design and participants

The ECHO survey was an anonymous online (Google® form) cross-sectional study. The survey was developed within the European Organisation for Research and Treatment of Cancer (EORTC) Lung Cancer Group (LCG), an independent non-profit cancer research organization aimed to improve cancer treatment for patients through the conduction and coordination of clinical and translational research. Between October 27, 2020, and November 30, 2020, all the EORTC LCG worldwide members (N = 497) were invited to complete the survey through a direct. A reminder was sent three weeks later. The respondents did not receive any incentive to complete the survey.

2.2. Survey description

The ECHO questionnaire was anonymous and confidential. The survey consisted of 32 open and closed short items and was divided into five sections: (i) characteristics; (ii) exercise in current clinical practice; (iii) knowledge of guidelines for exercise in cancer; (iv) perceptions about exercise; and (v) barriers and facilitators for promoting exercise.

The ECHO survey was the result of a rigorous co-design process that involved experts, such as oncologists, exercise specialists and epidemiologists. The pilot version of the questionnaire was built from items used in prior research, exploring the knowledge, current practice behaviors, barriers, and facilitators regarding exercise in oncology [24,27,29–32]. Subsequently, this pilot version was shared within the EORTC LCG board, which includes oncology care providers with different nationalities, to give feedbacks and make an unofficial *peer review* to finalize the current version.

We collected characteristics from healthcare providers including: sex, country, primary area of clinical practice (specialty), years in practice, work setting, primary tumor group treated, and the number of patients with lung cancer seen in a typical week. The Godin's Leisure Time Exercise Questionnaire was proposed to assess healthcare professionals' exercise level [33]. It includes three items, assessing the frequency of vigorous, moderate, and light exercises for at least 15 min. Different metabolic equivalents of the task (9 for vigorous, 5 for moderate, and 3 for light) were used to calculate the Leisure Score Index (LSI). LSI, calculated as the sum of (vigorous × 9) + (moderate × 5), permits to classify a person as active (LSI ≥ 24) or insufficiently active (LSI < 24) [33], according to the current guidelines [34]. Based on previous studies [27,29,31,32], the exercise in the current clinical practice section was referred to the frequency of assessment of patient's exercise, advice to increase exercise, patient's referral to exercise programs/providers, and the reinforcement about the importance to exercise. These four items were evaluated through a 5-point Likert scale ranging from "always" to "never". An additional question was added to measure which parameters are considered important to advise or not the patient to exercise. A list of clinical (e.g., lung cancer stage, type of

treatment, life expectancy) and non-clinical (e.g., compliance, caregiver presence, socioeconomic condition) parameters was provided, and study participants may choose up to three responses.

The knowledge about exercise guidelines was assessed with two questions, adapted by Schmitz et al. [14] to evaluate patient's physical activity: "How many days per week do you advise your patients to perform aerobic activity at moderate intensity (where the hearts beats faster and the breathing harder than normal, e.g., walking, cycling, running, swimming) for 30 min or more?" and "How many days per week do you advise your patients to perform physical activity to increase muscle strength (e.g., lifting weights, bodyweight exercise, climbing)?" Based on the current American College of Sports Medicine (ACSM) Exercise Guidelines for Cancer Patients, a frequency of three or more aerobic exercises and two or more days for strength activities was considered appropriate.

Eleven items adapted from prior researches [30–32] were proposed to assess belief and perception from healthcare providers' perspective about exercise, using a 5-point Likert scale ranging from "strongly agree" to "strongly disagree". The items were referred to benefits, safety, and feasibility of exercise; if exercise improved cancer-related fatigue and pain; if exercise increases physical fitness; if patients with metastatic disease should avoid exercise; if exercise counseling should be a standard part of cancer treatment intervention; if clinicians have or need more training about exercise knowledge. Finally, a list of potential barriers and facilitators, drawn from previous studies [24,25,29] was provided. Survey participants may choose up to three barriers and up to three facilitators that considered as major obstacles or incentives to promote exercise.

2.3. Statistical analysis

General information was analyzed using descriptive statistic. Descriptive analyses, presented as frequencies and percentages, were used for categorical variables. Logistic regression models were applied to identify participants characteristics (gender, primary area of clinical practice, years in clinical practice, work setting, main professional area, number of patients with lung cancer seen in an average week, physical activity level) associated with patterns in terms of exercise assessment, advice, reinforcement, and referral. Data were analyzed using SPSS version 28.0 software, whereas statistical tests were two-sided, and p values < 0.05 were considered significant.

2.4. Demographic and general characteristic

A total of 141 respondents completed the survey (28% of the members approached). Demographic and general information of the ECHO healthcare provider participants are summarized in Table 1. More than half were males (62%), 28% were from Italy and 15% from France, 50% were medical oncologists, 62% worked in a university or academic center, and 44% had > 15 years clinical experience. Regarding the professional practice, 51% treated a number of different types of oncological disease, while 35% exclusively treated patients with lung cancer. Forty percent saw 11–25 patients with lung cancer weekly, and 59% of the respondents did not meet the set recommendation for physical activity themselves.

2.5. Exercise in current clinical practice

Table 2 displays the frequency with which survey respondents addressed patients' exercise. The majority (63%) reported that they always or most of the time assessed patients' exercise; 43% reinforced the importance of engaging in exercise. Almost half (43%) advised patients to increase exercise only some of the time, and most of the healthcare provider participants (61%) indicated that they rarely or never referred patients to an exercise program or specialist. Fig. 1 illustrates the most important parameters considered when recommending patients to increase their exercise level. The major limitations healthcare providers

Table 1
Characteristics of the 141 survey respondents.

Characteristics	N	%
Sex		
Male	87	62
Female	54	38
Country		
Italy	40	28
France	21	15
United Kingdom	18	9
Belgium	13	9
Spain	12	9
Netherlands	9	6
Germany	7	5
Portugal	6	4
Switzerland	4	3
Slovenia	3	2
Denmark	2	1
Turkey	2	1
Jordan	1	1
Romania	1	1
Poland	1	1
Ireland	1	1
Primary area of clinical practice		
Medical oncology	71	50
Radiation oncology	40	28
Pneumonology	21	15
Surgical oncology	5	4
Diagnostic Radiology	3	2
Rehabilitative medicine	1	1
Years in clinical practice		
0–5	19	13
6–10	29	21
11–15	31	22
> 15	62	44
Work setting		
University or academic center	87	62
Hospital based non-academic center	27	19
Cancer center	25	18
Stand-alone (non-hospital based)	2	1
Main professional area		
Exclusively to patients with lung cancer	50	35
To patients affected by different types of oncological disease	72	51
To patients affected by different types of oncological and non-oncological disease	19	13
Number of patients with lung cancer seen in an average week		
< 10	34	24
11–25	57	40
26–50	43	30
> 50	7	5
Physical activity level		
Insufficiently active	83	59
Active	58	41

considered when recommending exercise included poor performance status (49%), short life expectancy (43%), presence of comorbidities (37%) and symptoms (36%). The logistic regression analysis revealed that male clinicians were more likely to advise their patients to exercise compared to females (odds ratio [OR] = 2.68, 95% confidence interval [CI] = 1.26 to 5.69). Compared to healthcare providers visiting < 10 patients with lung cancer per week, those who saw 11–25 patients (OR = 1.90, 95% CI = 0.73–4.94), or 26–50 patients (2.83, 95% CI = 1.05–7.63) or > 50 patients (4.33, 95% CI = 0.80–23.57) were more likely to advise their patients to exercise. Regarding referral, compared to medical oncologists, radiation oncologists refer fewer patients with lung cancer to an exercise program (OR = 0.70, 95% CI = 0.13–3.76), while other healthcare provider categories (pulmonologists, surgeons, diagnostic radiologists, and physiatrists) were more likely to refer patients to an exercise specialist (OR = 4.80, 95% CI = 1.42–16.21). Results of logistic regressions are available in Supplementary Material 1.

Table 2
Frequency of assessments of patients' exercise.

Clinical practice	Response %				
	Always	Most of the time	Some of the time	Rarely	Never
Visiting your patient affected by lung cancer how often do you:					
Assess a patient's exercise	27	36	21	10	6
Advise a patient to increase exercise	9	29	43	16	4
Refer patients to exercise program or ex specialist/ kinesiologist/ physiotherapist	4	6	28	42	19
Repeatedly reinforce the importance of being engaged in exercise	11	32	31	20	6

2.6. Knowledge of guidelines for exercise in cancer

Details on respondents' advice on frequency of aerobic, strength exercises and their combination are presented in Fig. 2. Overall, 39% of the healthcare provider participants advised patients to do aerobic activity at least three times per week, and 27% advised patients to perform strength activities at least two times per week. Combining aerobic and strength recommendations, 18% of the healthcare provider participants advised patients to perform both aerobic (at least three times per week) and strength (at least two times per week) activities.

2.7. Perceptions about exercise

Respondents' perceptions on exercise in cancer are detailed in Table 3. Overall, a large majority strongly agreed or agreed that exercise is safe and feasible (81%), beneficial (99%), improves cancer-related fatigue (81%) and increases physical fitness (98%). The survey respondents disagreed or strongly disagreed that exercise would worsen cancer pain (58%), should be avoided in patients with bone metastasis (61%), and patients with metastatic disease (88%). About 87% of the healthcare provider participants strongly agreed or agreed that exercise counseling intervention should be a standard part of cancer treatment intervention (87%) and that clinicians need more training about the impact of exercise in oncology (89%). The respondents disagreed or strongly disagreed that clinicians have adequate training in exercise counseling intervention in oncology (64%) and about knowledge of the exercise guidelines in cancer (53%).

2.8. Barriers and facilitators to promoting exercise

Responders' opinions regarding barriers and facilitators in promoting exercise are summarized in Fig. 3. The top four features hindering exercise promotion included: (i) patients' comorbidities and physical status (55%), (ii) lack of specific exercise programs to address patients with lung cancer (50%), (iii) lack of time for counseling or set up a referral (48%) and (iv) lack of resources regarding exercise for patients with lung cancer (40%). Strategies to enhance exercise in patients with lung cancer were: (i) referral to educational sessions (63%), (ii) having a kinesiologist available as part of clinical team (57%), (iii) training of healthcare providers (52%) and (iv) specific booklets/pamphlets for patients (42%).

3. Discussion

The ECHO survey suggests that, although lung cancer oncology care providers know the benefits of exercise in this population, 63% of these

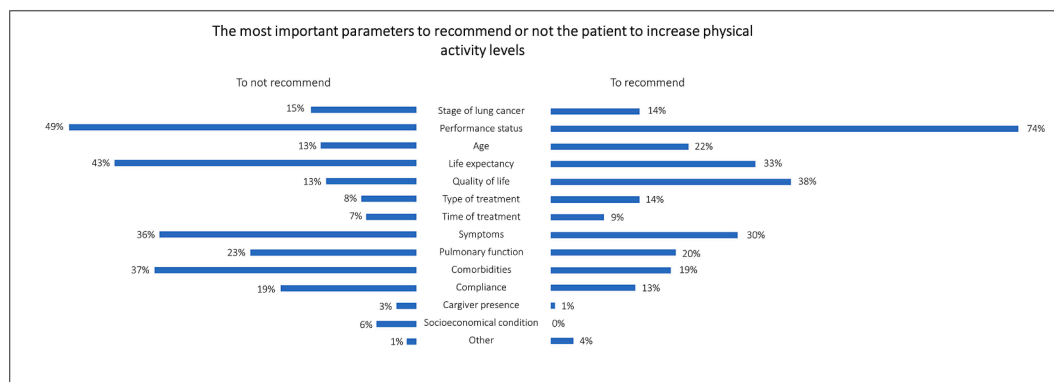


Fig. 1. Clinical and non-clinical parameters to advise or not the patient to exercise.

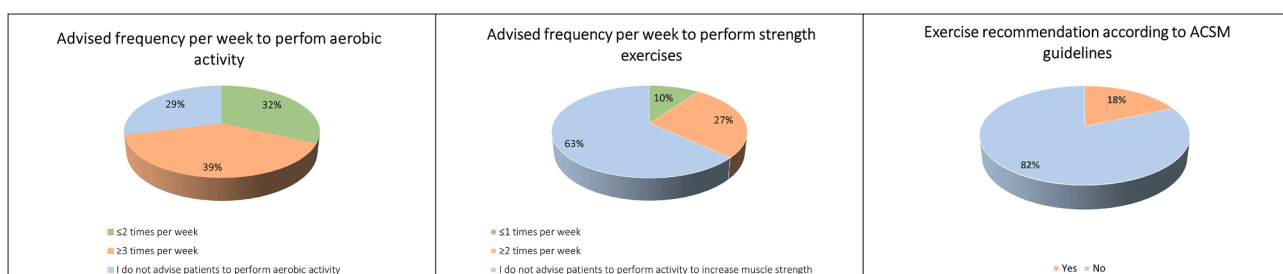


Fig. 2. Knowledge about exercise recommendations in patients with cancer.

Table 3
Respondents' perspectives on issues related to exercise.

Perception	Response, %				
	Strongly agree	Agree	No opinion/ Neutral	Disagree	Strongly disagree
Exercise is beneficial (physically and psychologically)	71	28	1	0	0
Exercise improves cancer-related fatigue	38	43	12	4	4
Exercise improves physical fitness	55	43	2	0	0
Exercise is safe and feasible	26	55	17	2	0
Exercise worsens cancer pain	2	6	34	48	10
Exercise should be avoided in patients with bone metastases	2	13	25	50	11
Patients with metastatic disease should not exercise	0	1	11	55	33
Exercise counseling/intervention should be a standard part of cancer treatment intervention	29	58	11	2	0
I have had adequate training in exercise counseling intervention in oncology	4	11	22	38	26
Clinicians need more training about impact of exercise in oncology	39	50	8	1	1
I know very well the guidelines for exercise in cancer	5	16	26	30	23

professionals assessed exercise levels in their patients, and less frequently, they advised patients to increase exercise levels (38%) and reinforce the importance of being physically active (43%), with only 10% of clinicians referring their patients to exercise programs.

Although the percentage of exercise assessment and advice described in this study may be considered overall positive, recent data reported slightly higher frequencies. Ligibel et al. with a survey distributed to the American Society of Clinical Oncology members reported that 78.6% assessed patient's physical activity and 72.3% advise patients to increase physical activity during anticancer treatments [29]. About referral, our findings are in line with previous studies showing lower rates compared to assessment/advice. Nevertheless, whereas Hardcastle and colleagues found that 23% of oncologists referred patients to an exercise specialist [27], only a 10% of referral was described in this

series.

Our low rate of roll out of the recommendations may be explained by the fact that, although study participants recognize the benefits of exercise, they probably do not feel so confident to deliver a counseling (i. e., practical recommendations). Indeed, 64% declared inadequate training in exercise counseling and believed that clinicians need more education about cancer exercise. To fill these gaps recently, the ACSM has proposed specific but straightforward instructions for clinicians to assess, advise, and refer patients to appropriate exercise programs [14].

Exploring the influence of healthcare provider's characteristics on exercise promotion, this study found that male oncology providers were more likely to advise their patients to exercise than females, and clinicians treating 26–50 patients with lung cancer per week advised their patients to exercise more frequently than oncology care providers seeing <10 patients/week. Moreover, compared to medical oncologists, other categories, including pulmonologists, surgeons, diagnostic radiologists, and physiatrists, were more likely to refer patients with lung cancer to an exercise program. Prior investigations evaluated the relationship between personal attributes of oncology providers and exercise promotion, finding that clinicians with >10 years of practice were more likely to advise their patients to exercise compared to those with less professional experience [35]. The reasons supporting these findings are still unclear. Overall, 59% of oncology providers participating in this study did not meet the current physical activity guidelines, and no correlation between exercise promotion and personal physical activity levels was detected. This last point is still highly debated with controversial evidence [26,28,35].

Regarding the specific type of advised exercise, only 39% of oncology providers recommend performing aerobic exercise at a moderate intensity at least three times per week, 63% did not advise patients with lung cancer to perform strength activities, and only 18% instructed their patients to perform a combined training. Although these percentages are not in accordance with the recent ACSM recommendations [13], they are in line with other studies reporting the oncologists' lack of awareness about exercise guidelines [25,27]. Muscle wasting, sarcopenia, lack of strength, and cardiorespiratory fitness are recognized prognostic factors in patients with lung cancer [4,36,37] and these variables, are largely demonstrated to be improved by exercise [38,39], ideally as part of a multidisciplinary approach including nutrition and smoking cessation [40]. Whereas aerobic exercise is considered the major determinant to improve cardiorespiratory fitness, the strength component specifically acts on muscles, increasing their size and strength. In this sense, it is important to share knowledge about the exercise guidelines among physicians, thus they can advise patients on an exercise routine, aerobic and resistance activities in order to improve these parameters.

Oncology care providers (99%) indicated a positive perception of exercise in the lung cancer setting. They felt that exercise was safe, even for patients with advanced or bone-metastatic disease, beneficial, and able to improve cancer-related fatigue and physical fitness. To reinforce this assumption, about 87% of the respondents indicated that an exercise intervention should be a standard part of cancer treatments. Studies reported similar findings [27,30,35], meaning that healthcare providers should be allied in promoting patients' exercise. Encouragement from oncology care professionals is particularly important, as, from patients' perspective, the support from their oncologist represents a crucial incentive to increase their active lifestyle [41,42]. The ECHO study revealed a series of barriers and facilitators potentially interfering with promoting exercise in the lung cancer setting. Lack of time during visits and lack of specific exercise programs to address patients are common features with prior studies hindering the promotion of an active lifestyle [24,25]. Clinicians reported patient's comorbidities and poor physical status as the major obstacles against exercise advice. A large proportion of patients with lung cancer indeed have significant symptoms such as fatigue and shortness of breath which can impair exercise, particularly of an aerobic nature. Nevertheless, if physical activity is tailored to

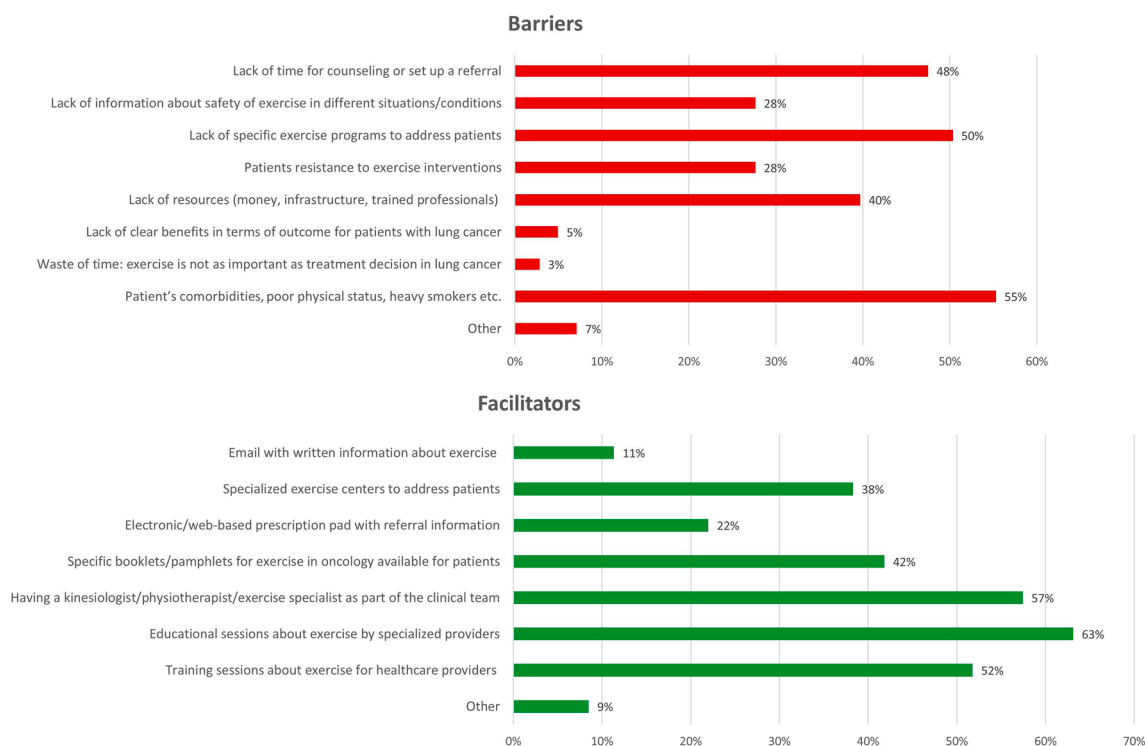


Fig. 3. Barriers and facilitators to promote exercise in lung cancer care.

patients' conditions, it may mitigate adverse effects [13]. Educational and training sessions for both patients and providers, as well as the presence of an exercise specialist as part of the clinical team, could be effective strategies to support the exercise intervention. However, these results strongly call for the need to increase knowledge about exercise guidelines, e.g., through the implementation of toolkits (webinars, screening tools).

The main limitation of the ECHO study is the relatively small number of respondents ($n = 141$). Although prior data reported a higher response rate [25], others estimated a lower number of respondents [27,29]. There may have been bias towards survey respondents having more interest in this topic, most were members of academic/university hospitals and dedicated cancer centers, which usually provide a more comprehensive cancer care, including exercise. However, the ECHO study has advantages of having been conducted through an international cancer research organization, including a high percentage of respondents who were very experienced (44% had been in practice for >15 years) and who have treated other tumours, where there is more data on the use of exercise. The ECHO questionnaire was not formally validated. Nevertheless, almost all the included items were drawn from previously published research investigating the opinion of oncology care providers about exercise in the oncological setting. Moreover, it was extensively reviewed from the EORTC LCG board members, which have a wide experience in survey design, conduction, and analysis [43,44].

Information obtained from this survey may help designing clinical trials, including exercise assessment and recommendation as exploratory objectives. For example, considering the perceived barriers, facilitators, and the lack of knowledge about exercise guidelines, a future study could investigate the impact of oncology care providers' mandatory instructions to patients on exercise levels, with a subsequent measurement on patients' outcomes compared to history controls or prospective lung function assessment. This intervention should be specifically tailored according to patients' characteristics, based on the current exercise guidelines, and including additional supporting tools, as educational sessions and/or the availability of an exercise specialist.

4. Conclusion

In conclusion, the ECHO study represents the first investigation exploring oncology care providers' opinions and practices about exercise in patients with lung cancer. Future structured and well-designed strategies and initiatives are needed to enhance an effective referral pathway in order to implement specific exercise programs and further support patients with lung cancer in their lifestyle and disease course. In this sense, simple tools to assess and refer patients to exercise programming, or initiatives, as the insertion of an exercise specialist inside the oncological unit, may make exercise easier to deliver effectively.

CRediT authorship contribution statement

Sara Pilotto: Conceptualization, Investigation, Methodology, Project administration, Resources, Supervision, Writing – original draft, Writing – review & editing. **Alice Avancini:** Conceptualization, Data curation, Formal analysis, Investigation, Methodology, Writing – original draft, Writing – review & editing. **Jessica Menis:** Investigation, Resources, Visualization, Writing – review & editing. **Isabella Sperduti:** Formal analysis, Investigation, Resources, Writing – review & editing. **Matteo Giaj Levra:** Investigation, Visualization, Writing – review & editing. **Thierry Berghmans:** . **Paolo Bironzo:** Investigation, Visualization, Writing – review & editing. **Mariana Brandão:** Investigation, Visualization, Writing – review & editing. **Dirk De Ruyscher:** Investigation, Visualization, Writing – review & editing. **John Edwards:** Investigation, Visualization, Writing – review & editing. **Corinne Favre-Finn:** Investigation, Visualization, Writing – review & editing. **Nicolas Girard:** Investigation, Visualization, Writing – review & editing. **Laurent Greillier:** Investigation, Visualization, Writing – review & editing. **Lizza Hendriks:** Investigation, Visualization, Writing – review & editing. **Sylvie Lantuejoul:** Investigation, Visualization, Writing – review & editing. **Murielle Maurer:** Investigation, Visualization, Writing – review & editing. **Silvia Novello:** Investigation, Visualization, Writing – review & editing. **Mary O'Brien:** Investigation, Visualization, Writing – review & editing. **Martin Reck:** Investigation, Visualization, Writing –

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Declaration of Competing Interest

The authors declare that they have no known competing financial interests or personal relationships that could have appeared to influence the work reported in this paper.

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Appendix A. Supplementary data

Supplementary data to this article can be found online at <https://doi.org/10.1016/j.lungcan.2022.05.009>.

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