










International perspectives on exercise oncology: current state, challenges, and opportunities for future development

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Abstract

Exercise oncology has emerged as a distinctive area of research and clinical practice. To obtain a global overview of this field, we summarize viewpoints from experts across 6 continents on (1) the scope of exercise oncology research and programs, (2) the availability of reimbursement for cancer exercise services, and (3) pathways and initiatives for developing the exercise oncology workforce. From an international perspective, the field of exercise oncology has progressed substantially; however, gains made to date are uneven, with general underdevelopment in Africa, Asia, and South and Central America. In addition, the availability of cancer exercise services continues to fall short of the increasing demand worldwide. With the upcoming formation of the International Society of Exercise Oncology, we suggest leveraging coordinated efforts from the global exercise oncology community to optimize research capacity, enhance workforce development, and expand the delivery of exercise services to advance the field across the world.

Introduction

The area of exercise and cancer has gained substantial attention, emerging as a distinctive area of research and clinical practice, known as *exercise oncology*.¹ With nearly 1000 publications on average each year since 2014 (based on a title and abstract search in PubMed using the terms *exercise* and *cancer*), the field of exercise oncology now involves numerous scholars worldwide advancing the understanding of exercise medicine (the use of exercise as an intervention to prevent and manage medical conditions) in cancer. To date, multiple oncological and exercise science organizations globally have endorsed exercise as a prophylactic and therapeutic intervention for cancer.^{2–6}

This rapid growth of exercise oncology has prompted researchers and practitioners in the field to consider the need for a dedicated international organization to foster research collaboration and coalesce efforts in making exercise standard in cancer care. To this end, a planning meeting for the International Society of Exercise Oncology (ISEO) was held on May 28, 2024, in Boston, Massachusetts, USA. In this meeting, there was an

International Perspectives session, where speakers representing Africa, Asia, Australia, Europe, North America, and South and Central America presented (1) the scope of exercise oncology research and programs, (2) the availability of reimbursement for cancer exercise services, and (3) pathways and initiatives for developing the exercise oncology workforce, in their respective continent.

In this paper, we summarize the presentations from the International Perspectives session in the context of the broader literature being published, with a view to highlighting progress made and major challenges faced in each continent. Subsequently, we discuss opportunities for continuously advancing the field of exercise oncology around the world.

Geographic landscapes of exercise oncology

The vast heterogeneity in health-care systems and available resources across, and even within, countries resulted in a complete global overview of exercise oncology being unattainable. In this circumstance, the authors contacted researchers and

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practitioners in exercise oncology, rehabilitation, and cancer care, as well as exercise oncology consortia where present, in all countries of North America, Australia, and major countries across Africa, Asia, Europe, and South and Central America through accessible network resources. Responses from 31 countries and areas to the authors' queries on exercise oncology-related activities were received and included in this report (Supplementary file). Although the current report represents the most comprehensive evaluation of exercise oncology globally, possible contributions from countries not included because of nonresponse and restraints in network resources, such as India in Asia, should not be overlooked.

A summary of continent-specific characteristics of exercise oncology research, cancer exercise services, service coverage, and workforce development is outlined in Table 1, with detailed information provided in the sections below. We discuss exercise oncology per continent (in alphabetical order) in an attempt to

better illustrate any context-specific facilitators and barriers to research and clinical practice.

Africa

Overall, exercise oncology research led by African researchers is underdeveloped, with only a small number of studies published to date, consisting of very few clinical intervention trials, as indexed in PubMed. For example, there is only one African-led clinical intervention trial (quasi-experimental design) listed on PubMed among the sampled African countries, which was published in 2021.⁷ The limited progress of exercise oncology research in Africa over the past few decades against the background of robust growth globally and particularly in countries with high Human Development Index (HDI), such as the United States and Australia,⁸ is related to inadequate funding and other resources along with lack of awareness. Similar barriers were previously reported for cancer research as a whole in Africa.⁹

Table 1. Characteristics of exercise oncology development in each continent

| Characteristics | Africa | Asia | Australia | Europe | North America | South and Central America |
|-----------------------|--|---|--|---|---|---|
| Research scope | Very limited in breadth and depth | Limited in research outputs with the majority being review-based and observational studies | Substantial number of publications and broad in research methodologies addressing diverse topics | Substantial number of publications and broad in research methodologies addressing diverse topics | Substantial number of publications and broad in research methodologies addressing diverse topics | Limited in research outputs with the majority being epidemiological, review-based, and biological studies; clinical interventional studies largely pilot in nature and focus on specific contexts |
| Program availability | Limited with challenges to implement widely | Limited availability and fragmented in delivery by clinical rehabilitative specialists (eg, physiotherapists) | Widely available in hospitals, cancer centers, and community-based facilities through clinical exercise physiologists | Widely available in hospital and community-based settings; typically delivered by trained professionals | Widely available in hospital and community-based settings as a standalone service or part of cancer rehabilitation; delivered by trained medical (eg, physical therapists) and exercise professionals (physiologists) | Limited availability and typically included as part of cancer rehabilitation in public hospitals through physiotherapists |
| Service coverage | Limited with some countries payable through private medical aids | Limited to virtually no coverage | Reimbursable via public and private funds if referred by a general practitioner as part of a broader rehabilitation or chronic disease management plan | Reimbursable via public and private funds | Reimbursable via public and private funds if delivered by licensed medical professionals (eg, physiatrists) | Limited to virtually no coverage |
| Workforce development | Limited opportunities | Limited and mainly relying on training programs outside of the region | Numerous avenues through university education (main avenue) and private training providers | Numerous avenues through university education and private training providers | Numerous avenues through programs by private training providers and universities | Limited with certification programs available in a few countries through partnership with providers outside of the region |

Table 2. Examples of workforce development initiatives

| Region | Example initiatives |
|---------------------------|---|
| Africa | Maple Tree Cancer Alliance ^a (South Africa): https://www.maple trecanceralliance.org/international-license-program/ |
| Asia | China Anti-Cancer Association Exercise Therapist Certification (China): http://www.jsimra.org.cn/article/255 Cancer Exercise Training Institute ^b (Taiwan): https://www.facebook.com/CETTaiwan/ |
| Australia | Edith Cowan University Exercise Oncology Professional Development Course: https://www.exercisemedicine.org.au/professional-development University of New South Wales Exercise Oncology Course: https://handbook.unsw.edu.au/postgraduate/courses/2025/EXPT4100 |
| Europe | MOVE-ONKO (Germany): https://move-onko.de CanRehab (United Kingdom): https://www.canrehab.com Onconet (Netherlands): https://www.onconet.nu Dansk Selskab for Onkologisk and Palliativ Fysioterapi (Denmark): https://www.onkpalphysio.dk |
| North America | American College of Sports Medicine–American Cancer Society Cancer Exercise Specialist (United States): https://members.acsm.org/ItemDetail?iProductCode=CES23 Livestrong–Maple Tree Cancer Alliance CancerFit Trainer Certification (United States): https://livestrong.org/how-we-help/cancerfit/ Cancer Exercise Training Institute ^b (United States): https://www.thecancerspecialist.com |
| South and Central America | Thrive Health (Canada): https://thrivehealthservices.com/professionals/certification/ Maple Tree Cancer Alliance ^a (Brazil): https://www.maple trecanceralliance.org/international-license-program/ |

^a Maple Tree Cancer Alliance is an exercise oncology education provider based in the United States, which has certifications implemented via partnership with local organizations in many countries and areas in Africa, Asia, and South and Central America.

^b Cancer Exercise Training Institute is a private, for-profit educational provider based in the United States, which has certification programs delivered globally.

This notable gap highlights the need for studies tailored to African contexts, taking into account the unique aspects of resource availability and health-care systems.¹⁰

Implementing cancer exercise services in Africa is highly challenging because of inaccessibility to sufficient care and lack of funding, although variations may exist between countries. In Africa, professionals who have competency in prescribing and implementing exercise for clinical populations include biokineticists, physiotherapists, exercise physiologists, sports scientists, and sports and exercise medicine physicians. However, these professionals may not have adequate competency in oncology and are not widely accessible, particularly in remote and underserved areas, further limiting the delivery of cancer exercise services. A recent survey reported that, on average, there are only 2 physiotherapists per 100 000 people across Africa.¹¹ Moreover, the profession of biokineticists, largely based in South Africa, shows a considerable disparity in distribution across the country, ranging from 0.9 to 5.8 biokineticists per 100 000 people depending on socioeconomic development of provinces.¹² Despite these barriers, there are emerging initiatives to improve cancer exercise services. For example, many nonprofit organizations devoted to cancer care in South Africa, such as PinkDrive,¹³ Michi Filotimo,¹⁴ and CHOC Childhood Cancer Foundation,¹⁵ are striving to improve awareness and recognition of exercise as an important part of cancer care, which in turn should increase the availability of exercise oncology programs in the country.

Reimbursement for cancer exercise services is highly variable across Africa, and some countries have no coverage at all. Typically, relevant services, where available, may be paid through private medical assistance as part of comprehensive cancer care. However, the coverage is often insufficient, and patients often incur additional out-of-pocket expenses, limiting the adoption of cancer exercise services. As a result, there is an urgent need for an African-led white paper that clearly defines the value of exercise in cancer care and serves as a foundation to expand coverage. In the interim, efforts are underway, including meetings with medical funders, to improve the recognition of exercise as part of multidisciplinary cancer care and thereby ensure better coverage.

There are currently limited opportunities in Africa for the development of an exercise oncology workforce, and thus initiatives should be urgently pursued. One approach would be to introduce undergraduate students in exercise and sports medicine to the concept of exercise oncology by developing a specific educational module. Another practical way is to increase access to world's leading exercise oncology certification programs, including programs by private educational providers as recently initiated in South Africa (Table 2). In addition, it is advisable to add a symposium or discussion topics focusing on exercise oncology in exercise and sports medicine–related conferences to raise awareness and generate interest of exercise professionals, which should stimulate their engagement in the field. The 2024 Congress of the South Africa Sports Medicine Association has already made an important step by including a symposium dedicated to exercise oncology; however, more such initiatives are needed to build momentum. Lastly, it is essential for governments to allocate specific funds or leverage corporate sponsorships to support professional training.

Asia

There is an increasing interest in exercise oncology research in Asia. A PubMed search in May 2024 identified 68 separate clinical trials led by researchers from sampled countries and areas, most published in the past 10 years, examining various forms of Western (eg, resistance training) and Eastern (eg, Qigong) origin exercise in diverse patient populations.^{16,17} Apart from the growing trend in published trials, several Asian countries are taking initiatives to accelerate advancements in exercise oncology research. For example, China and Japan have recently published exercise guidance resources for cancer management.^{18–20} In addition, Yonsei University in South Korea has been hosting an annual exercise oncology symposium since 2022, with the aim of establishing a national platform to disseminate exercise oncology research.

In general, cancer exercise services in Asia remain at an early stage, with few programs and limited utilization (Table 3). For example, in China, cancer exercise services are centralized in public hospitals with sufficient rehabilitative resources. Patients

Table 3. Cancer exercise programs

| Region (no. programs ^a) | Example programs | Settings | | Delivery modes | | Main funding | |
|-------------------------------------|--|----------|-----------|----------------|-----------|--------------|---------|
| | | Hospital | Community | Online | In-person | Public | Private |
| Africa (4) | FILOTIMO FIT (South Africa): https://www.filotimo.org.za/ff-nicole-fuller | | ✓ | | ✓ | | ✓ |
| Asia (19) | Exercise Is Medicine (EIM) for Cancer Survivors (Hong Kong): https://www.ahc.hku.hk/eim-cancer-survivors | | ✓ | | ✓ | | ✓ |
| Australia (31) | 365 Rhythmic Exercise (Singapore): https://www.365cps.org.sg/365-rhythmic-stretching-exercise/ | | ✓ | ✓ | ✓ | | ✓ |
| | Vario Exercise for Cancer Programs: https://www.exercisemedicine.org.au/vario-health-clinic | | ✓ | ✓ | ✓ | | ✓ |
| | GenesisCare: https://www.genesiscare.com/au/patient-support/integrative-cancer-care/exercise-therapy | ✓ | | | ✓ | ✓ | ✓ |
| | LifeNow Exercise: https://cancerwa.asn.au/cancer-support/get-support/emotional-physical-wellbeing/life-now-exercise-and-meditative-courses/ | | ✓ | | | ✓ | ✓ |
| Europe (78) | OnkoAktiv (Germany): https://netzwerk-onkoaktiv.de | ✓ | ✓ | | ✓ | ✓ | ✓ |
| | Aktive Mot Kreft (Norway): https://aktivmotkreft.no | ✓ | | ✓ | ✓ | | ✓ |
| | GenesisCare ^b (United Kingdom): https://www.genesis-care.com/uk/integrative-cancer-care/exercise-medicine | ✓ | | ✓ | ✓ | | ✓ |
| North America (2155 ^c) | Moving Through Cancer (United States): https://hillman.upmc.com/cancer-care/exercise-oncology | ✓ | | ✓ | ✓ | ✓ | ✓ |
| | Livestrong at the Young Men's Christian Association (United States): https://www.ymca.org/what-we-do/healthy-living/fitness/livestrong | | ✓ | | ✓ | | ✓ |
| | Maple Tree Cancer Alliance (United States): https://www.mapletreecanceralliance.org/exercise-programs/ | | ✓ | ✓ | | | ✓ |
| | Exercise for Cancer to Enhance Living Well (Canada): https://kinesiology.ucalgary.ca/labs/health-and-wellness/research/research-studies/exercise-cancer-enhance-living-well-excel | | ✓ | ✓ | ✓ | ✓ | ✓ |
| South and Central America (18) | Instituto do Câncer do Estado de São Paulo Cancer Rehabilitation (Brazil): https://icesp.org.br | ✓ | | | ✓ | ✓ | ✓ |
| | Instituto Clínico Oncológico del Sur Metabólico Rehabilitation (Chile): https://www.clinicaicos.cl/programa-rehabilitacion-metabolica/ | ✓ | | | ✓ | ✓ | ✓ |

^a Partly based on the data in Moving Through Cancer Directory (<https://www.exercisemedicine.org/eim-in-action/moving-through-cancer/>) as of January 6, 2025, and numbers may not necessarily reflect all existing programs in the region.

^b GenesisCare is a cancer care provider that is based in Australia and operates in the United Kingdom and many other countries.

^c Most (n = 2133) of the programs are in the United States, which are accessible at the directory described above.

gain access to these services mainly through treating oncologists' referral as inpatient care, suggesting a passive engagement with the support of exercise therapy for patients. In a similar fashion, in South Korea, exercise, recommended by the National Cancer Centre as part of survivorship care, is also primarily offered in clinical settings, such as hospitals and cancer centers.²¹ In Singapore and Hong Kong, although exercise services are accessible to patients beyond clinical settings, the number of available programs remains fairly limited, and service delivery is often inconsistent.

Reimbursement policies specifically supporting cancer exercise services in Asia are still lacking. At present, various payment options have been identified for exercise oncology programs. For example, in Hong Kong and Singapore, programs provided in a community setting are primarily supported by donations, corporate sponsorships, government grants, and self-funding. In addition, in Singapore, the costs of exercise therapy for cancer may be covered by the national health-care financing system (MediSave and MediShield Life) as part of patients' cancer treatment if prescribed by clinicians. In China, similar to Singapore, compensation for exercise therapy is available through the National Basic Medical Insurance Scheme, with reimbursable amounts varying depending on the insurance program and the

type of care a patient receives (ie, inpatient vs outpatient). For instance, up to 90% coverage is available to patients enrolled in the Urban Employee Basic Medical Insurance who receive exercise therapy as inpatients. For patients under the same insurance program but treated as outpatients, an annual compensation amount of less than ¥2,000 (approximately US \$280) applies for all hospital services deliverable (including exercise therapy). However, the cost of a typical cancer exercise session (45-60 minutes) in Chinese hospitals is approximately ¥50 (<US \$10), and thus, financial incentives for staff to provide exercise therapy are low. Some hospital-based exercise oncology programs in China are also funded through clinicians' project funds if undertaken as part of research.

Training for cancer exercise professionals in Asia is in its infancy but gaining momentum through various avenues and initiatives. A pathway identified is through certification programs by private educational providers from the United States (examples provided in Table 2). These organizations have partnered with local fitness institutions to improve program accessibility to professionals who are interested in working in the oncology setting. Additionally, the Cancer Exercise Specialist Course endorsed by the American College of Sports Medicine (ACSM) and the American Cancer Society and exercise oncology educational

programs by Edith Cowan University, Australia, are also contributing to workforce development in Asia. These programs, however, are mainly undertaken by professionals who have sufficient English competency, which limits access to many in Asia. Notably, in China, initiatives to develop localized certification programs have progressed. For example, the China Anti-Cancer Association has recently introduced the Cancer Exercise Therapist Certification. This certification program, which includes online and offline components, commenced the provision of training in January 2024.

Australia

Australia has a well-established research culture in exercise oncology. Since the first exercise intervention study in Australian patients with cancer published in the early 2000s, there has been exponential growth of exercise oncology research outputs.²² According to a SciVal search conducted in May 2024, Australia ranked as the second most published country in exercise oncology internationally ($n = 466$), covering a broad range of research topics and methodologies. A key example of Australian exercise oncology research is the publication of the world's first position statement in 2009 by Exercise and Sports Science Australia (ESSA), endorsing exercise medicine for cancer and cancer treatment.²³ This statement, along with the update in 2019,² greatly increased the recognition of exercise medicine in cancer care in the Australian clinical community.

The number of exercise oncology programs has increased substantially over the past 20 years, reflecting a wide implementation of exercise for cancer in Australia. Although still limited, there are currently programs that are integrated within hospitals and cancer centers, providing structured exercise interventions to patients through colocated exercise clinics.^{24,25} This integrated model has been reported as a promising way for promoting exercise during cancer treatment based on patient satisfaction and clinician support identified in a separate evaluation.²⁶ In addition to hospital-based programs, there are numerous community-based programs delivered by accredited exercise physiologists, such as Vario exercise for cancer programs by Edith Cowan University and LifeNow Exercise by Cancer Council Western Australia. In Australia, accredited exercise physiologists are advanced practitioners who have professional accreditation from ESSA. Currently, there are 8504 accredited exercise physiologists in Australia, with nearly a quarter ($n = 2093$) listing cancer as an area of practice. This large and continually growing workforce, supported by evidence-based guidelines from Australian exercise and oncology professional organizations, plays a crucial role in ensuring that patients with cancer receive high-quality exercise care.^{2,23,27,28}

In Australia, exercise oncology services are supported through a combination of public and private health-care funding mechanisms. Patients with cancer can receive up to 5 consultations per calendar year with an accredited exercise physiologist (including telehealth services), partially funded (85%) under the public health-care system (Medicare) when referred by a general practitioner. In addition to Medicare, private health insurances also support accredited exercise physiologist services, including those specifically related to cancer management, often as part of a broader rehabilitation or chronic disease management plans.²⁹ Most cancer exercise services in hospital settings are taxpayer funded, requiring little to no out-of-pocket expenses for patients. Despite the funding support, in-hospital cancer exercise services remain limited, and patients in need generally rely on outpatient or community-based programs for ongoing care.²⁴ This disparity underscores the need for continuing advocacy to expand service

availability and streamline reimbursement processes, broadening access to benefit more patients.

The exercise oncology workforce in Australia is prepared through university education and professional development courses. Australia has a well-established educational system for training clinical exercise specialists. Of the 38 Australian universities that offer programs in exercise science, 27 currently offer ESSA-accredited exercise physiology courses, ensuring that graduates align with competency standards required to work with people with various conditions, including cancer. In addition to structured university education, exercise professionals can upskill through shorter-term exercise oncology courses widely available through private providers and universities.

Europe

Exercise oncology research in European countries has grown substantially since the landmark trial by Dimeo et al.³⁰ from Germany in the late 1990s firstly demonstrating that exercise can reduce chemotherapy-related complications. Today, Europe is one of the most prolific regions for exercise oncology research. According to the Web of Science database, half of the top 10 countries with the most publications on exercise and cancer are in Europe, including England, Germany, the Netherlands, Italy, and Spain. The field continues to expand in Europe, as evidenced by numerous ongoing research studies and increasing transnational collaborations. For example, in the sampled European countries (including Turkey and Israel), there are 69 active studies on exercise and cancer (based on an unpublished survey by J. Wiskemann in 2024). Of these, 7 are multinational collaborations addressing various aspects of adult and childhood patients with cancer, such as exercise accessibility, treatment side effects, and quality of life.³¹⁻³⁷

Cancer exercise services in Europe have expanded greatly since 1981, when the first recorded program was established at the German Sport University Cologne focusing on patients with shoulder dysfunction following breast cancer surgery.³⁸ Today, a wide variety of exercise programs are available across Europe, serving patients with diverse needs.³⁹ A recent survey of the sampled European countries (including Turkey and Israel) identified 81 programs across community-based and hospital-based settings, which are accessible for everyone following a cancer diagnosis.⁴⁰ Although not yet mandated as a standard care, many European countries have incorporated exercise into their national cancer plans as part of integrated cancer care, accessible through hospital and community-based facilities.³⁹ For example, exercise therapy for cancer in Scandinavia is available in local municipality settings under the supervision of health professionals (mainly physiotherapists).^{39,41} In addition, there is an increasing number of exercise facilities in Europe dedicated to patients with cancer, such as cancer fitness centers operated by Aktiv Mot Kreft throughout Norway and LeoSport in Regensburg, Germany, ensuring the availability of cancer-specific exercise programs.

Various private and public funds are available in Europe to pay for cancer exercise services. Of the programs identified in the sampled European countries (including Turkey and Israel), more than 85% are funded through private (eg, sponsorships and donations) and/or public (eg, government subsidies) sources.⁴⁰ Coverage of therapeutic exercise through third-party payers is often included as part of cancer rehabilitation-related services; however, the extent and scope of coverage vary between countries because of differences in health-care systems. For example, in Germany, where rehabilitation is included in the national

social security system, cancer rehabilitation services (including exercise) are financed by statutory pension insurance for patients who are deemed eligible for rehabilitation partly based on prognosis.³⁹ In contrast, in Switzerland, similar services are covered through basic and supplementary health insurances, regardless of prognosis.⁴² Despite available financial support, lack of funding is still the greatest challenge for many programs where out-of-pocket payments are often needed from patients, underscoring the need for actions to seek expanded coverage.⁴⁰

There are many ongoing efforts in Europe to build the exercise oncology workforce. A key initiative involves integrating exercise oncology content into exercise and health-related courses at the bachelor's and master's levels in many European countries, such as Germany, the United Kingdom, and the Netherlands. In addition, there are professional development programs provided by local organizations and beyond to train cancer exercise specialists outside of university (examples provided in Table 2). These programs typically target clinical therapists (eg, exercise physiologists and physiotherapists) and exercise professionals (eg, personal trainer and fitness instructor). However, there are also attendees with diverse backgrounds, such as nurses, physicians, nutritionists, and social workers, broadening exercise oncology professional resources.

North America

Exercise oncology researchers in North America (United States and Canada) have played a pivotal role in advancing this field since its inception. Not only were the earliest recorded epidemiological, preclinical, and clinical studies published from this region,¹ but North American researchers have also contributed a large proportion of the global body of work on exercise and cancer over the past 30 years. A Web of Science search in May 2024 identified more than 17 800 publications affiliated with North American countries, accounting for more than 50% of all publications from the top 10 most published countries in exercise oncology. The substantial research outputs have contributed greatly to the development of guidelines on exercise for cancer prevention and management by various professional organizations within this region and beyond, such as ACSM, the American Society of Clinical Oncology, ESSA, and the Spanish Society of Medical Oncology.^{2,3,6,43,44}

There are numerous cancer exercise programs in North America under supervision of trained professionals such as physical therapists, occupational therapists, and clinical exercise physiologists. A recently published cross-sectional study in the United States identified 2133 active exercise and rehabilitation (including exercise and other components) programs for patients with cancer provided through university-affiliated facilities (eg, BfitBwell and Get Real and Heel), hospitals (eg, Moving Through Cancer and Cancer Wellness for Life), and community-based settings (eg, LIVESTRONG and WellSpring).⁴⁵ However, statistically significant disparities exist in the geographic distribution of these programs, with patients in rural areas facing greater distance to programs than those in urban areas, resulting in inequitable access to exercise care and possibly, in turn, poorer patient outcomes.^{45,46} As such, there is a need for expanded online exercise programming across North America, where vast geography size poses a common challenge.

In North America, cancer rehabilitation services, often including exercise, provided by licensed medical professionals (eg, physiatrists) are covered by third-party payers, such as private insurers and government health-care programs (eg, Medicare). However, exercise services provided by exercise specialists, such

as exercise physiologists, are not yet covered by insurers. This gap has led to increasing calls for expanded coverage for cancer exercise services. A notable example is the recent request for a National Coverage Determination submitted to the Centers for Medicare and Medicaid Services, which, if approved, will broaden coverage for such services in the United States. Although exercise is not yet standard care, some accrediting bodies (eg, the American College of Surgeons Commission on Cancer and the National Accreditation Program for Breast Centers) require their accredited institutions to provide patients with access to exercise services.^{47,48} This highlights a growing consensus that exercise is an integral component of comprehensive cancer care, which is anticipated to drive greater financial support for patients and providers.

The development of the exercise oncology workforce in North America is supported by a variety of certifications, academic programs, and continuing education opportunities. A prominent certification is the Cancer Exercise Specialist offered by ACSM in partnership with American Cancer Society and CanRehab. This virtual training course includes 12 modules that cover the competencies essential for designing and delivering exercise programs for patients with cancer. Similar certification programs are accessible through private educational providers and universities in the United States and Canada (examples provided in Table 2). In addition, there is an increasing number of university courses in the United States focusing on exercise oncology, providing in-depth knowledge and practical experience in the field. In response to the increasing demand for trained cancer exercise professionals, the ACSM's *Essentials of Exercise Oncology* textbook was recently published as the first comprehensive guide to exercise oncology.⁴⁹ This textbook will serve as an important resource for individuals preparing to be credentialed in exercise oncology.

South and Central America

Exercise oncology research in South and Central America is limited mainly because of lack of funding and awareness of this research field. Most published studies led by researchers from this region are epidemiological, review based, or biological, with relatively few intervention trials. Further, intervention studies involving patients with cancer are typically pilot in nature, with small sample sizes and focus on specific contexts (eg, cancer type and setting). Despite the general underdevelopment of exercise oncology research, there is a growing recognition of the role of exercise in the prevention and management of cancer. For example, in a recently published cancer control guideline for this region, exercise is included as one of the recommendations for reducing cancer risk.⁵⁰ In addition, health and clinical oncology organizations in Brazil have recently issued physical exercise recommendations in Portuguese for the prevention and management of cancer.^{51,52}

Overall, exercise oncology programs remain scarce across South and Central America. A recent study evaluating cancer rehabilitation in 19 South and Central American countries revealed that only 9 countries provided some form of rehabilitation for cancer patients.⁵³ Even so, it should be noted that exercise may not necessarily be included as part of cancer rehabilitation available in all those countries. According to the best available data from the Moving Through Cancer Directory, an online catalogue of exercise oncology programs available worldwide (<https://www.exerciseismedicine.org/eim-in-action/moving-through-cancer/>),⁵⁴ there are only 4 South and Central American countries (Brazil, Chile, Colombia, and Peru) where cancer exercise services are available. In addition, several

programs listed in the directory serve no more than 10 patients per year, suggesting that programs available in some countries are fragmented and have limited accessibility.

Exercise oncology services in South and Central American countries, where available, are supported by government-funded public health-care systems as part of cancer rehabilitation for patients with documented rehabilitation needs and treated in public hospitals.⁵³ However, cancer rehabilitation is not universally mandated across South and Central American countries, suggesting that the coverage of cancer exercise services through governmental subsidies is limited. Although paying for cancer rehabilitation through private health insurance is available in some South and Central American countries (eg, Brazil), the number of people who are insured with a private policy remains low. For example, in Brazil, no more than 30% of its nationals have private health insurance.⁵⁵ As such, inadequate funding is a major barrier to the widespread implementation of cancer exercise services in the region.

The paucity of trained cancer exercise professionals in South and Central America is another barrier to the wide availability of exercise oncology programs, highlighting a pressing need for workforce development. However, professional training activities remain sporadic and are restricted to a few countries (including Brazil, Mexico, and Paraguay) largely through private educational providers outside of the region. Although the Exercise Is Medicine Latin American initiative has been offering training since 2011 to improve health-care professionals' competency in exercise prescription, this course is fairly brief, lasting only 8 hours in 1 day, and lacks a focus on cancer-specific exercise content⁵⁶ and, thus, limiting its utility in training cancer exercise professionals.

Opportunities for future development

Although substantial progress has been made in the past few decades, clearly there are unmet needs in exercise oncology research and practice globally, particularly in many low HDI countries in Africa, Asia, and South and Central America. This highlights the importance of continuing efforts from the exercise oncology community in a more cohesive way and the need for a dedicated international organization to facilitate this process. In echo of the agenda proposed in the Moving Through Cancer initiative,⁵ we suggest some opportunities for future development in the context of the forthcoming ISEO.

Optimizing research capacity

Optimizing research capacity is essential to advancing the field of exercise oncology. One priority should be to increase the number of high-quality clinical trials, with a particular focus on understudied populations. For example, there is a scarcity of adequately powered randomized controlled trials in patients with less common but aggressive cancers (eg, pancreatic cancer),⁵⁷ where recruitment is often a challenge, limiting a broad-spectrum application of exercise in cancer care. A possible solution is leveraging ISEO to foster collaborations across multiple consortia, as with the National Cancer Institute's Community Oncology Research Program.⁵⁸

Improving global representation in the field, particularly from underrepresented regions, such as Africa, is equally important, contributing to reduce disparities in research performance, thereby ensuring a more equitable advancement. To this end, strategies that mitigate contextual barriers to research faced by these regions should be taken into consideration. These could include establishing seed grants under ISEO or through

partnership with other established programs (eg, World Cancer Research Fund) to prioritize projects led by researchers from low HDI countries. Another suggested strategy is to form an ISEO workgroup that connects senior researchers from high HDI countries with research students and early career researchers from low HDI countries to build expertise and encourage collaboration. Lastly, establishing regional chapters of ISEO should be considered, which can strengthen the dissemination of research findings to local health-care stakeholders (eg, clinicians and policy makers), informing clinical guidelines and driving policy endorsement through enhanced awareness of the importance of exercise in cancer care. This, in turn, can also help increase funding opportunities for exercise oncology research from local authorities and organizations.

Workforce development for low HDI countries

Addressing the limited availability of cancer exercise services in low HDI countries across Africa, Asia, and South and Central America requires targeted workforce development initiatives. These should include providing training for local health-care professionals and new graduates of exercise-related courses. Exemplary certification programs developed through partnership between private educational providers from the United States and local organizations in China, Brazil, Mexico, and South Africa highlight the potential of this collaborative model. The forthcoming ISEO offers a unique opportunity to promote similar collaborations in other underserved countries for training programs that build core competencies needed to provide quality care for people following cancer diagnosis. One way to realize this potential could be through forming an ISEO-led accrediting panel to ensure these programs meet rigorous standards and gain global credibility. Another possible facilitator that ISEO may assume is to create a centralized database, analogous to the Exercise Oncology Program Directory, to extend the reach of certification and other educational programs that are endorsed or recommended by ISEO. In addition, establishing a global foundation, if possible, under ISEO to fund continuing education for professionals from low HDI countries can further reduce financial barriers and encourage participation.

Expansion of online exercise programming

Challenges including lack of trained professionals, insufficient infrastructure, and geographic distance impede access to cancer exercise services in many countries. Online exercise programming, which delivers exercise interventions in a home setting through real-time teleconference platforms (eg, Zoom and Microsoft Teams), offers a promising solution. Accumulating evidence demonstrates the feasibility and efficacy of such programs in patients with cancer.⁵⁹ Moreover, tele-exercise has shown potential for cost-effectiveness, as a single professional can supervise multiple patients across various locations, making it particularly advantageous in less-resourced but large-sized countries, such as Brazil.⁶⁰

However, expanding online programming is not without challenges. One obstacle is the limited access to the Internet in many African countries, highlighting the need for developing alternative resources, such as mobile apps that require no to minimal data usage. A special consideration should be given to designing user-friendly interfaces for such tools to address potentially low digital literacy among patients. Additionally, video-based educational packages that can be downloaded or distributed offline could serve as another viable option for development, ensuring access to exercise instructions without Internet restrictions.

Conclusion

From an international perspective, the field of exercise oncology has progressed substantially; however, gains made to date are uneven, with general underdevelopment in Africa, Asia, and South and Central America. Despite growing consensus on exercise as an integral part in cancer care, the availability of cancer exercise services continues to fall short of the increasing demand worldwide. To bridge these gaps, coordinated efforts from the global exercise oncology community should be leveraged to optimize research capacity, enhance workforce development, and expand the delivery of exercise services.

Author contributions

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References

- Schmitz KH. *Exercise oncology: prescribing physical activity before and after a cancer diagnosis*. Springer International Publishing; 2020.
- Hayes SC, Newton RU, Spence RR, Galvão DA. The Exercise and Sports Science Australia position statement: exercise medicine in cancer management. *J Sci Med Sport*. 2019;22:1175-1199.
- Campbell KL, Winters-Stone KM, Wiskemann J, et al. Exercise guidelines for cancer survivors: consensus statement from international multidisciplinary roundtable. *Med Sci Sports Exerc*. 2019;51:2375-2390.
- Rock CL, Thomson C, Gansler T, et al. American Cancer Society guideline for diet and physical activity for cancer prevention. *CA Cancer J Clin*. 2020;70:245-271.
- Schmitz KH, Stout NL, Maitin-Shepard M, et al. Moving through cancer: setting the agenda to make exercise standard in oncology practice. *Cancer*. 2021;127:476-484.
- Ligibel JA, Bohlke K, May AM, et al. Exercise, diet, and weight management during cancer treatment: ASCO guideline. *J Clin Oncol*. 2022;40:2491-2507.
- Odikpo LC, Chiejina EN. Assessment of practice and outcome of exercise on quality of life of women with breast cancer in Delta State. *Asian Pac J Cancer Prev*. 2021;22:2377-2383.
- UNDP. *Human Development Report 2023-24*. New York. 2024.
- Kayamba V, Mutale W, Cassell H, Heimbürger DC, Shu XO. Systematic review of cancer research output from Africa, with Zambia as an example. *J Clin Oncol Glob Oncol*. 2021;7:802-810.
- Douryang M, Pillay L, Mkumbuzi NS, Foti C. The World Health Organization's Rehabilitation 2030 vision: an African perspective. *Front Rehabil Sci*. 2024;5:1442626.
- World Physiotherapy Annual Membership Census 2020: Africa Region. <https://world.physio/sites/default/files/2021-02/AMC2020-Africa.pdf>. Accessed 25 February 2025.
- Tiwari R, Grobbelaar HW, Vermaak C, Chikte U. Strengthening the biokinetics workforce for improved services: a human resources for health review from 2000 to 2020. *S Afr J Sports Med*. 2023;35:v35i1a14184., v35i31a14184.
- PinkDrive. <https://pinkdrive.org>. Accessed 6 January 2025.
- The Machi Filotimo Cancer Project. <https://www.filotimo.org.za>. Accessed 6 January 2025.
- CHOC Childhood Cancer Foundation SA. <https://choc.org.za>. Accessed 6 January 2025.
- Taylor-Piliae RE, Newell KA, Cherin R, Lee MJ, King AC, Haskell WL. Effects of Tai Chi and Western exercise on physical and cognitive functioning in healthy community-dwelling older adults. *J Aging Phys Act*. 2010;18:261-279.
- Brown D, Leledaki A. Eastern movement forms as body-self transforming cultural practices in the West: towards a sociological perspective. *Cult Sociol*. 2010;4:123-154.
- Cong MH, Shi HP. Consensus of Chinese experts on exercise therapy for cancer patients. *Sci Sin Vitae*. 2022;52:587-602.
- Gu YH, Yang YF, Xu Y. *中国肿瘤整合诊治技术指南 (CACA): 运动康复 [CACA technical guidelines for holistic integrative management of cancer: exercise rehabilitation]*. Tianjin Science and Technology Press; 2023.
- Tsuji K, Sasai H, Kiyohara K, et al. Japan's cancer survivorship guidelines for exercise and physical activity. *Jpn J Clin Oncol*. 2025;55:12-20.
- Kim JY, Yi ES. Nationwide survey of cancer center programs in Korea. *J Exerc Rehabil*. 2017;13:300-306.
- Hayes SC, Rowbottom D, Davies PS, Parker TW, Bashford J. Immunological changes after cancer treatment and participation in an exercise program. *Med Sci Sports Exerc*. 2003;35:2-9.
- Hayes SC, Spence RR, Galvao DA, Newton RU. Australian Association for Exercise and Sport Science position stand: optimizing cancer outcomes through exercise. *J Sci Med Sport*. 2009;12:428-434.
- Dennett AM, Peiris CL, Shields N, Morgan D, Taylor NF. Exercise therapy in oncology rehabilitation in Australia: a mixed-methods study. *Asia Pac J Clin Oncol*. 2017;13:e515-e527.
- Newton RU, Kennedy MA, Singh F, et al. Safety, effectiveness, and uptake of exercise medicine integrated within a cancer care center. *Semin Oncol Nurs*. 2020;36:151073.

26. Kennedy MA, Bayes S, Galvao DA, et al. If you build it, will they come? Evaluation of a co-located exercise clinic and cancer treatment centre using the RE-AIM framework. *Eur J Cancer Care (Engl)*. 2020;29:e13251.
27. Cheema BS, Robergs RA, Askew CD. Exercise physiologists emerge as allied healthcare professionals in the era of non-communicable disease pandemics: a report from Australia, 2006-2012. *Sports Med*. 2014;44:869-877.
28. Cormie P, Atkinson M, Bucci L, et al. Clinical Oncology Society of Australia position statement on exercise in cancer care. *Med J Aust*. 2018;209:184-187.
29. Australian Institute of Health and Welfare (2022). Use of chronic disease management and allied health Medicare services. <https://www.aihw.gov.au/reports/chronic-disease/medicare-chronic-disease-allied-health-items>. Accessed 18 November 2024.
30. Dimeo F, Fetscher S, Lange W, Mertelsmann R, Keul J. Effects of aerobic exercise on the physical performance and incidence of treatment-related complications after high-dose chemotherapy. *Blood*. 1997;90:3390-3394.
31. de Boniface J, Altena R, Haddad Ringborg C, Bolam KA, Wengstrom Y. Physical exercise during neoadjuvant chemotherapy for breast cancer as a mean to increase pathological complete response rates: trial protocol of the randomized NeoACT trial. *PLoS One*. 2022;17:e0274804.
32. Lie HC, Anderssen S, Rueegg CS, et al. The physical activity and fitness in childhood cancer survivors (PACCS) study: protocol for an international mixed methods study. *JMIR Res Protoc*. 2022;11:e35838.
33. Hiensch AE, Monninkhof EM, Schmidt ME, et al. Design of a multinational randomized controlled trial to assess the effects of structured and individualized exercise in patients with metastatic breast cancer on fatigue and quality of life: the EFFECT study. *Trials*. 2022;23:610.
34. Anandavadivelan P, Cardinale D, Blomhoff R, et al. Blood flow restriction exercise in the perioperative setting to prevent loss of muscle mass in patients with pancreatic, biliary tract, and liver cancer: study protocol for the PREV-Ex randomized controlled trial. *Trials*. 2024;25:356.
35. Advanced modeling baltic cancer e-care (AMBER), <https://amber.ku.lt/en/advanced-modeling-of-baltic-cancer-e-care-amber>. Accessed 7 November 2024.
36. FORTEe—get strong to fight childhood cancer, <https://www.youthcancereurope.org/fortee-get-strong-to-fight-childhood-cancer/>. Accessed 7 November 2024.
37. PREFERABLE-II: personalised exercise-oncology for improvement of supportive care, <https://ecpc.org/health-and-research/preferable-ii/>. Accessed 7 November 2024.
38. Schüle K. Thirty years of physical activity in oncology in Germany—from the birth of the first rehabilitative cancer sports group until today. *Eur Rev Aging Phys Act*. 2013;10:61-64.
39. Hellbom M, Bergelt C, Bergenmar M, et al. Cancer rehabilitation: a Nordic and European perspective. *Acta Oncol*. 2011;50:179-186.
40. Voland A. *Exercise is medicine in cancer! But how do we implement exercise into routine clinical care? Doctoral Dissertation*. Heidelberg University; 2024.
41. Christensen JF, Simonsen C, Hojman P. Exercise training in cancer control and treatment. *Compr Physiol*. 2018;9:165-205.
42. Dehler A, Cabaset S, Schmid M, Schneider-Mörsch B, Sperisen N, Rohrmann S. Outpatient multidisciplinary cancer rehabilitation in Switzerland: a status assessment. *J Public Health (Berl)*. 2023;31:807-815.
43. Patel AV, Friedenreich CM, Moore SC, et al. American College of Sports Medicine roundtable report on physical activity, sedentary behavior, and cancer prevention and control. *Med Sci Sports Exerc*. 2019;51:2391-2402.
44. Pollan M, Casla-Barrio S, Alfaro J, et al. Exercise and cancer: a position statement from the Spanish Society of Medical Oncology. *Clin Transl Oncol*. 2020;22:1710-1729.
45. Schmitz KH, Demanelis K, Crisafio ME, et al. Proximity to cancer rehabilitation and exercise oncology by geography, race, and socioeconomic status. *Cancer*. 2025;131:e35515.
46. Stubblefield MD, Hubbard G, Chevillat A, Koch U, Schmitz KH, Dalton SO. Current perspectives and emerging issues on cancer rehabilitation. *Cancer*. 2013;119 Suppl 11:2170-2178.
47. National Accreditation Program for Breast Centers. *Optimal resources for breast care (2024 Standards)*. American College of Surgeons; 2023.
48. Commission on Cancer. *Cancer program standards 2012: ensuring patient-centered care. Version 2*. American College of Surgeons; 2012.
49. Schmitz KH, Schwartz AL, Campbell A. *ACSM's essentials of exercise oncology*. Lippincott Williams & Wilkins; 2024.
50. Espina C, Feliu A, Maza M, et al. Latin America and the Caribbean code against cancer 1st edition: 17 cancer prevention recommendations to the public and to policy-makers (World Code Against Cancer Framework). *Cancer Epidemiol*. 2023;86 Suppl 1:102402.
51. Sociedade Brasileira de Oncologia Clínica (SBOC), Instituto Nacional de Câncer (INCA), Sociedade Brasileira de Atividade Física e Saúde (SBAFS). *ATIVIDADE FÍSICA E CÂNCER: RECOMENDAÇÕES PARA PREVENÇÃO E CONTROLE [Physical activity and cancer: recommendations for prevention and control]*. In: São Paulo: SBOC; 2022.
52. Sociedade Brasileira de Oncologia Clínica (SBOC), Instituto Nacional de Câncer (INCA), Sociedade Brasileira de Atividade Física e Saúde (SBAFS). *Recomendações de Atividade Física Durante e Após Tratamento Oncológico [Physical activity recommendations for during and after cancer treatment]*. In: São Paulo: SBOC; 2023.
53. Villalobos VU, Silva ACM, Belmonte GH, et al. Current status of cancer rehabilitation in Latin America. *Curr Phys Med Rehabil Rep*. 2024;12:126-137.
54. Schmitz KH, Campbell AM, Stuiver MM, et al. Exercise is medicine in oncology: engaging clinicians to help patients move through cancer. *CA Cancer J Clin*. 2019;69:468-484.
55. Leite VF, Cecatto RB, Battistella LR, de Brito CMM. Establishing a cancer rehabilitation service in a middle-income country: an experience from Brazil. *Curr Phys Med Rehabil Rep*. 2022;10:339-344.
56. Duperly J, Collazos V, Paez C, Donado C, Pratt M, Lobelo F. "Exercise is Medicine" in Latin America: training health care professionals in physical activity prescription. *Médecine et Traumatologie du Sport Rivista Svizzera di Medicina e Traumatologia Dello Sport*. 2014;62:38-41.
57. Luo H, Galvao DA, Newton RU, et al. Exercise medicine in the management of pancreatic cancer: a systematic review. *Pancreas*. 2021;50:280-292.
58. McCaskill-Stevens W, Lyss AP, Good M, Marsland T, Lilenbaum R. The NCI Community Oncology Research Program: what every clinician needs to know. *Am Soc Clin Oncol Educ Book*. 2013;33:e84-e89.
59. Batalik L, Chamradova K, Winnige P, et al. Effect of exercise-based cancer rehabilitation via telehealth: a systematic review and meta-analysis. *BMC Cancer*. 2024;24:600.
60. Bergerot PG, Bergerot CD, Silva JRG, et al. Exercising and immuno-oncology treatment (ExIO): a prospective pilot study for patients with solid tumors. *Support Care Cancer*. 2024;32:840.

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