

## Exercise Testing

Appraisal of cardiorespiratory fitness, and therefore use of exercise testing, is not normally performed in the clinical management of cancer patients other than to establish the preoperative physiologic status or risk (i.e., operability) of individuals with pulmonary malignancies. Formal exercise testing guidelines have been published by various organisations (e.g., American Thoracic Society/American College of Chest Physicians [ATS/ACCP; European Respiratory Society [ERS]) and you are referred to the ATS/ACCP suggestions for a comprehensive overview of exercise testing methodology for clinical populations (see [Table 1](#)).

**Table 1.** Summary of Exercise Testing for Patients with Cancer.

Testing Type	Modality	Protocol	Clinical Metrics	Clinical implications	Considerations
<b>Maximal cardiorespiratory</b>	<ul style="list-style-type: none"> <li>• Treadmill</li> <li>• Cycle ergometer</li> <li>• Arm ergometer</li> </ul>	Individualised protocols, based on physical activity history and comorbidities	<ul style="list-style-type: none"> <li>• Peak oxygen consumption</li> <li>• METs</li> <li>• Peak workload</li> <li>• Heart rate</li> <li>• Respiratory exchange ratio</li> <li>• Treadmill time</li> </ul>	Provides basis for determining starting point for exercise training. Used to stratify presurgical risk. Used to evaluate response to training program.	Cancer treatment may result in cardiomyopathy, pulmonary fibrosis, or neuropathy.
<b>Submaximal cardiorespiratory</b>	<ul style="list-style-type: none"> <li>• Cycle ergometer</li> <li>• Walking path</li> </ul>	<ul style="list-style-type: none"> <li>• 6 min walk.</li> <li>• Constant workload</li> </ul>	<ul style="list-style-type: none"> <li>• Distance</li> <li>• Heart rate</li> <li>• Perceived exertion</li> </ul>	Used to evaluate response to training program.	Sensitivity to detect changes may be reduced in more fit individuals.
<b>Muscle strength and endurance</b>	<ul style="list-style-type: none"> <li>• Machine weights</li> </ul>	<ul style="list-style-type: none"> <li>• One-repetition maximum (1RM)</li> <li>• Multiple-repetition maximum</li> </ul>	<ul style="list-style-type: none"> <li>• Kilograms</li> </ul>	Provides basis for determining starting point for exercise training. Used to evaluate response to training program.	Modify or avoid 1RM tests with lymphedema or recent surgery
<b>Flexibility</b>	<ul style="list-style-type: none"> <li>• Goniometry</li> </ul>	<ul style="list-style-type: none"> <li>• Active stretching</li> </ul>	<ul style="list-style-type: none"> <li>• Degrees</li> </ul>	Used to evaluate response to training program.	Avoid pain; assess upper extremity range of motion postmastectomy.

Notionally, a cancer diagnosis and the use of established and original therapies may increase the risk of exercise testing–related difficulties, although the evidence reported in a contemporary systematic review indicate that maximal and submaximal exercise testing are somewhat safe procedures in cancer survivors. The ATS and ACCP stated that the risk of death and life-threatening complications during exercise testing is 2 to 5 per 100,000 tests.

It is **not feasible** to screen or provide cancer-specific recommendations for all identified cancer types; however, for certain forms of cancer, knowing which organ system or systems are involved may be directly helpful. For instance, clients with lung cancer may be at a greater risk for an adverse event, given that both the pathophysiology of the disease and associated comorbid disorders are often connected with a history of smoking. These clients are considered higher risk, and referral to a health professional is necessary for electrocardiogram, exercise testing, and other tests, as appropriate. If such testing is normal, clients are cleared for physical activity. If testing is notable, depending on the outcome, clients may be cleared for supervised exercise training in a rehabilitation program with skilled staff.

## Pre-exercise Cancer Evaluation

The strong body of evidence demonstrates that exercise is a safe and applicable intervention for individuals living with cancer. Consequently, external to the typical preparticipation screenings for exercise testing and training for clients free of cancer, most cancer survivors do not need to pursue additional medical clearance beyond current ACSM guidelines before partaking in a low-moderate-intensity exercise program. However, for individuals with metastatic disease or those presently undergoing cancer treatments, some considerations may require additional medical clearance.

As part of the pre-exercise evaluation, the following cancer-specific history should be considered/documentated:

- Cancer type
- TNM stage
- Surgery date(s) and type
- Treatment dates and type
- Cancer-specific medications (e.g., oestrogen inhibitor, androgen inhibitor)
- Any new signs or symptoms
- Most recent complete blood count

The specialist exercise professional should attempt to ascertain any acute signs or symptoms that could be associated to treatment toxicity and thus would require further medical consultation before participation in exercise. For instance, fractures correlated to metastatic bone disease are a specific concern with exercise. Consequently, any indications of bone sensitivity—particularly in the pelvis, back, or legs should be communicated to the oncologist.

During radiation therapy (RT), the areas proximal to the radiation treatment area (e.g., skin, lungs, bones) need consideration because the concentrated nature of RT may cause individuals to experience sensitivity or reduced flexibility. The occurrence of these symptoms, which may be due to radiation disfiguring, may require a plan of light stretching and movement. Conversely, if bone was directly exposed to the

radiation field, there may be an elevated risk of bone fracture, so circumventing that area until a medical evaluation is completed would be warranted.

After cancer surgery, particular exercises and physical tasks may need to be modified or omitted. For instance, restricting upper body exercises in females who have recently undertaken breast surgery may be required. However, there can be a considerable variance (i.e., 1-8 week) for when to commence or continue upper body exercises or movements. This solidifies the need for suitable communication with the oncology team since factors such as surgery type (i.e., breast-sparing surgery vs. mastectomy vs. mastectomy with reconstruction) and client symptoms (e.g., pain, redness, swelling) will establish when you can include or progress particular types and modes of exercise.

Further critical outcomes that require communication with the oncologist, or other medical providers, include febrile neutropenia, anaemia, the presence of pain and swelling in an arm or leg that could be due to lymphedema, numbness in the extremities associated with neuropathy, the presence of an ostomy bag, and unusual bleeding, which can occur because of bone marrow suppression or surgery. Finally, nonspecific complaints of fatigue and weakness may require slow progression of exercise and further investigation if these symptoms progress worsen. All these factors must be considered before a patient begins a structured exercise program and continually re-evaluated throughout the program. See [Table 2 below](#) on Contraindications to Exercise for Patients with Cancer.

Contraindications to Exercise for Patients with Cancer
<ul style="list-style-type: none"><li>• Haemoglobin <math>&lt;10.0 \text{ g} \cdot \text{dL}^{-1}</math></li><li>• White blood cells <math>&lt;3,000 \cdot \text{mL}^{-1}</math></li><li>• Neutrophil count <math>&lt;0.5 \cdot 10^9 \cdot \text{mL}^{-1}</math></li><li>• Platelet count <math>&lt;50 \cdot 10^9 \cdot \text{mL}^{-1}</math></li><li>• Fever <math>&gt;38 \text{ }^\circ\text{C}</math> (<math>100.4 \text{ }^\circ\text{F}</math>)</li><li>• Unsteady gait (ataxia)</li><li>• Cachexia or loss of <math>&gt;35\%</math> of premorbid weight</li><li>• Limiting dyspnea with exertion</li><li>• Bone pain</li><li>• Severe nausea</li><li>• Extensive skeletal metastases</li></ul>

