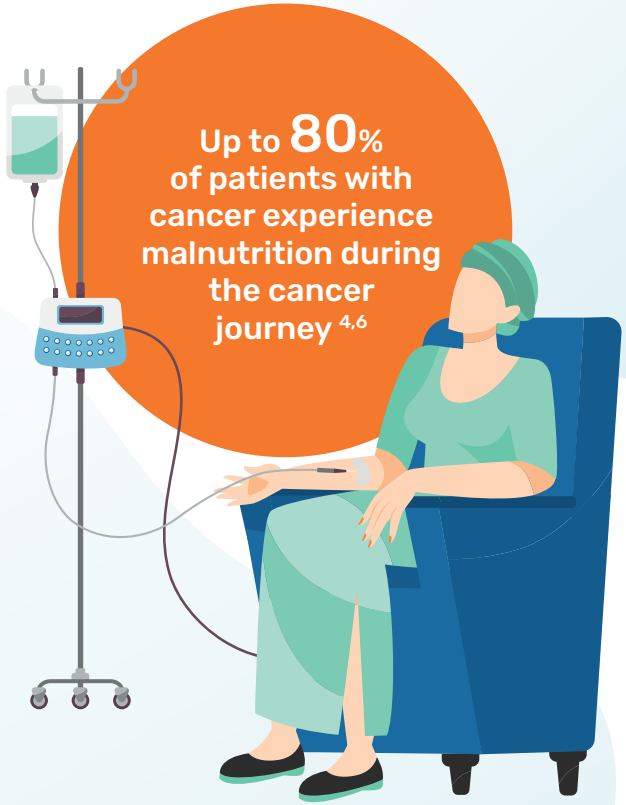
Danone Nutricia Campus

Nutrition Essentials: Oncology

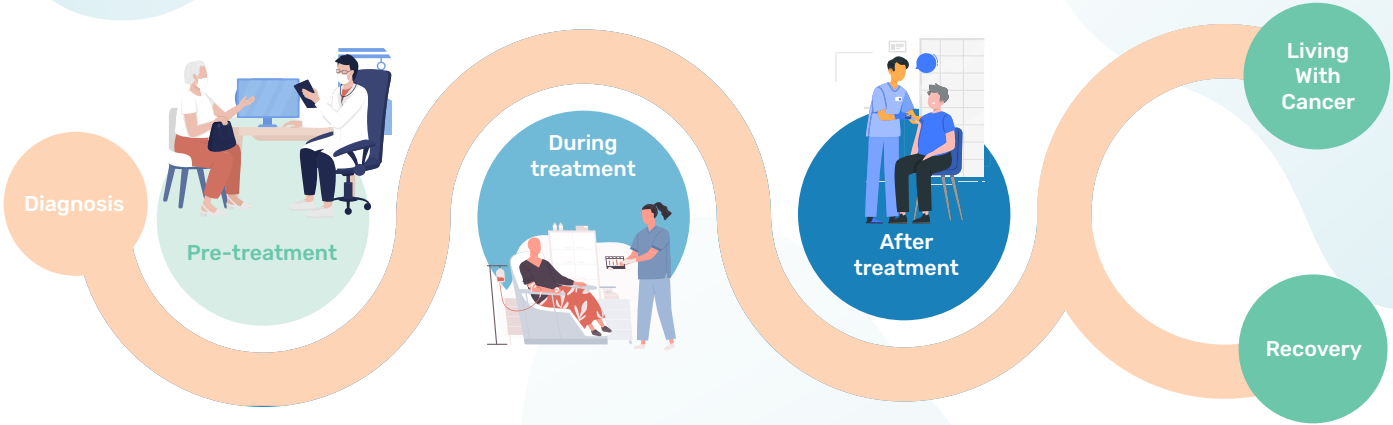
The role of nutrition in the cancer journey

Optimal cancer care necessitates nutritional support

- Most patients with cancer experience metabolic and psychological stress, sensory alterations, poor appetite and malabsorption, resulting in malnutrition.[1-3]
- Weight and muscle loss due to malnutrition in patients with cancer negatively impacts clinical outcomes such as post-surgery recovery, treatment tolerance and quality of life.[4]
- Nutritional support in patients with cancer can ensure optimal treatment outcomes and improve quality of life.[5]



Nutritional challenges are common, can evolve and persist throughout the cancer treatment journey



Most cancer treatments are associated with malnutrition

Weight and muscle loss can put your treatment plan at risk with:

- Increased toxicities[7]
- Increased risk of infection[8,9]
- Increased length of hospital stay[10-12]
- Decreased survival[4,13-15] Up to 20% of cancer deaths are attributed to malnutrition rather than to the malignancy itself[6]

- Side effects from cancer treatments such as nausea, vomiting, mucositis, dry mouth and diarrhea, further compound the reduction in food intake and increase the risk of malnutrition.[16]

Cancer-related malnutrition and/or low muscle mass (sarcopenia) may lead to suboptimal treatment outcomes[17,18]

Lower muscle mass is a significant, independent predictor of:

Early treatment discontinuation termination[19]

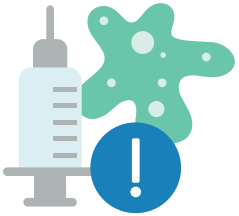
OR: 2.34
(p=0.03,
95% CI: 1.04-5.24)

Dose reductions[19]

OR: 2.28
(p=0.01,
95% CI: 1.19-4.36)

Risk of high-grade adverse events is increased

>5x



in patients with low muscle mass and/or low muscle attenuation* receiving cancer immunotherapy[20]

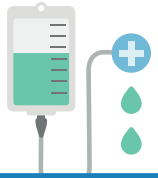
Dose-limiting toxicity occurs more frequently in patients with low muscle mass (sarcopenia)[21]

*Low muscle attenuation refers to a poor-quality skeletal muscle (increased intramuscular adipose tissue)

Early nutritional intervention improves patient outcomes during cancer treatment

Radiotherapy

- Medical nutritional intervention during radiotherapy improves nutritional intake, body weight, muscle mass and quality of life.[22,23]
- Early nutritional intervention improves tolerance to radiotherapy treatment, fewer hospitalizations and emergency visits.[24,25]



Systemic anti-cancer treatment

- High protein supplementation leads to better chemotherapy tolerance[26] and improved quality of life.[27]
- High protein supplementation improves body weight and muscle mass during chemotherapy.[26,27]

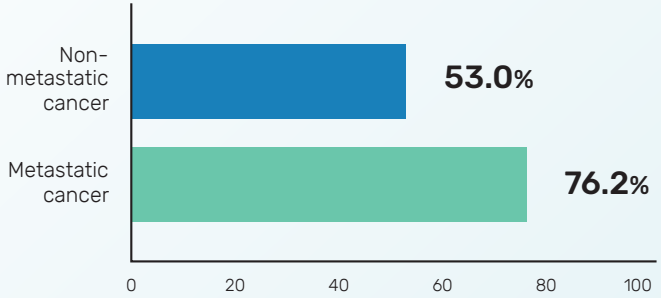
Surgery

- Nutritional support reduces post-operative complications by up to 50%.[28,29]
- Reduction in length of hospital stay by ~2.5 days is observed.[29,30]

Weight and muscle loss are frequently observed in both the early and advanced stages of cancer[21,31]

- Up to 65% of patients with cancer experience weight loss at their first medical oncology hospital visit, with a weight loss range of 1–10 kg.[31]
- Weight loss prevalence is higher among patients with metastatic cancer.[31]
- Up to 90% of patients with cancer have low muscle mass[21]

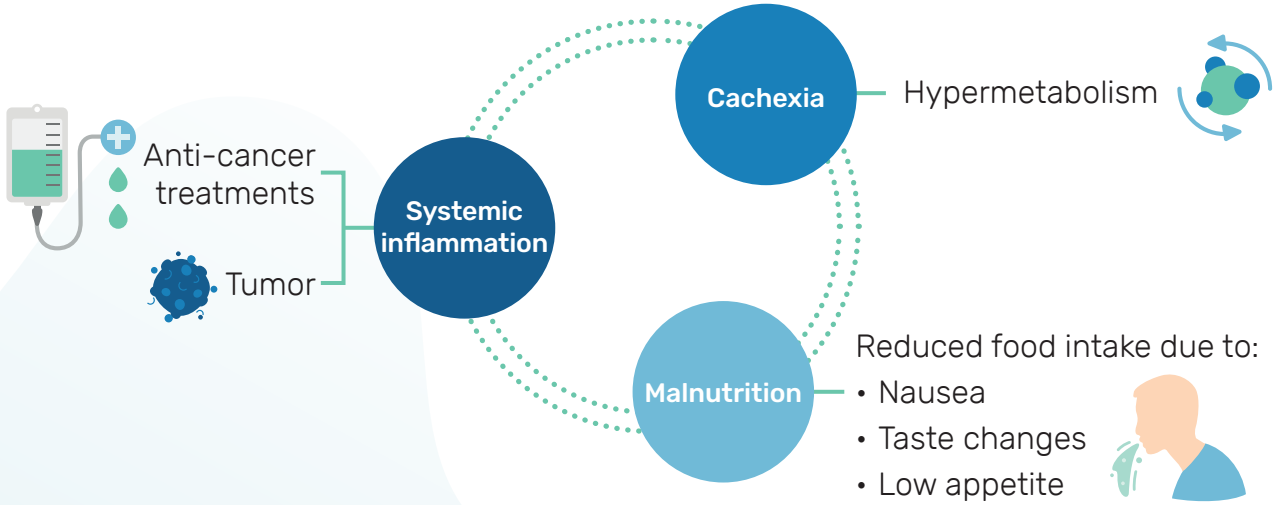
Weight loss prevalence according to metastasis[31]



Cancer and its treatments can accelerate muscle loss and physical decline[32,33]

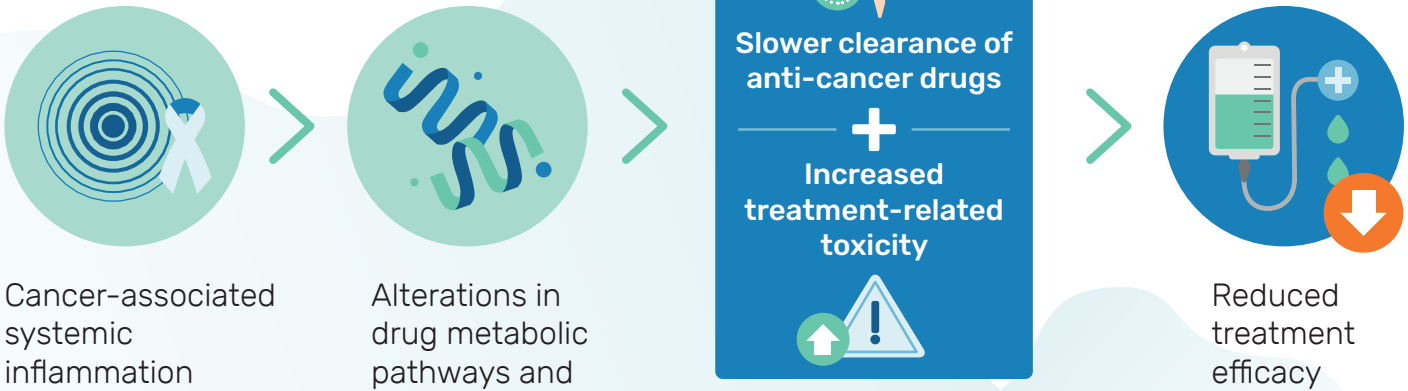
Assessing the risk of malnutrition early in the cancer journey should be prioritized to allow initiation of nutritional support, if necessary[31]

Systemic inflammation accelerates the cycle of malnutrition and cachexia[34,35]



Systemic inflammation is a hallmark of cancer-related malnutrition[34] that contributes to anorexia, metabolic changes, and muscle and fat depletion[35]

Systemic inflammation can reduce the success of anti-cancer treatment[36-39]



Cancer-associated systemic inflammation

Alterations in drug metabolic pathways and drug transporters, especially cytochrome P450 3A4

Reduced treatment efficacy

Omega-3 polyunsaturated fatty acids have established anti-inflammatory properties[40-42]

Increased

- Production of eicosanoids with lower biological potency
- Production of anti-inflammatory endocannabinoids
- Production of proresolution resolvins and protectins

Reduced

- Leucocyte chemotaxis
- Adhesion molecule expression and leucocyte-endothelial adhesive interactions
- Production of pro-inflammatory eicosanoids from arachidonic acid (prostaglandins, leukotrienes)
- Production of inflammatory cytokines
- T-cell reactivity

Oral nutritional supplements enriched with EPA, an omega-3 polyunsaturated fatty acid, can reduce inflammation and improve nutritional status, weight, and muscle mass in patients with cancer[43-47]

EPA, eicosapentaenoic acid

Nutritional support in patients with cancer should consider change in taste perception

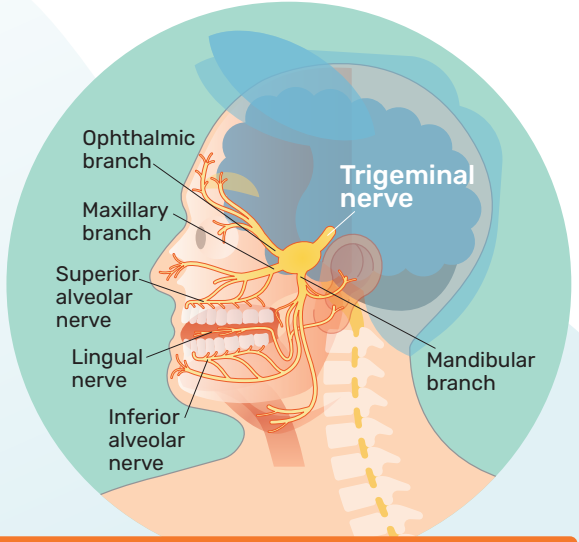
- Up to 70% of patients with cancer experience taste alterations during treatment[2]
- Taste changes can include:[49]

78% Metallic taste

68% No sense of taste

57% Bitter taste

- The trigeminal somatosensory system, which plays a fundamental role in experiencing flavor, may be impacted by chemical agents such as those used in chemotherapy.[48]
- Sensory adapted flavors may be used for patients experiencing taste alterations.



The need for intense taste stimuli can be met by adding more spices, salt and ginger to meals.[50,51]

Diarrhoea is a frequent side effect of anti-cancer treatment[52]

Patients with cancer can have an impaired GI function due to:

Location of the tumour

(particularly in the GI tract) can disrupt normal digestion and absorption processes[53]

Anti-cancer treatment

can lead to inflammation of the gut mucosa (mucositis), a common side effect which can lead to GI issues[54]

Surgical excision of GI tumours

can induce alterations in the digestive tract's structure or function[55,56]

Up to 47% of patients treated with chemotherapy have diarrhoea[52]

- **Diarrhea, a common symptom of malabsorption, can lead to malnutrition by hindering the proper absorption of nutrients.**
- **This, along with abdominal discomfort, can also lead to reduced food intake.**

ESPEN guidelines recommend the use of formulas containing peptides and triglycerides to aid nutrient absorption[57]

Formulas containing peptides and medium chain triglycerides (MCTs) can facilitate absorption in case of malabsorption or short bowel syndrome[57]

- Medical nutrition containing **peptide-based proteins** and **fats as MCTs** can alleviate symptoms of diarrhoea[58,59].

Abbreviations: GI: Gastrointestinal

Dysphagia in cancer can significantly impede patients' ability to eat and drink[64]

Dysphagia occurs in:

up to **80% of patients with head and neck cancer**.[60] Severe dysphagia can develop within 15 days of starting concomitant chemoradiotherapy treatment.[61]

up to **68% of patients with upper GI cancer.**[62]

from **12 to 68% of patients with lung cancer** depending on disease stage.[63]

Dysphagia in cancer can significantly impede patients' ability to eat and drink.[64]

Nutritional strategies need to be tailored to address dysphagia

Adequate energy and protein intake

Patients with cancer have **higher energy and protein requirements**.[40]
However, patients often fail to consume sufficient quantities of food to meet their needs.[65]

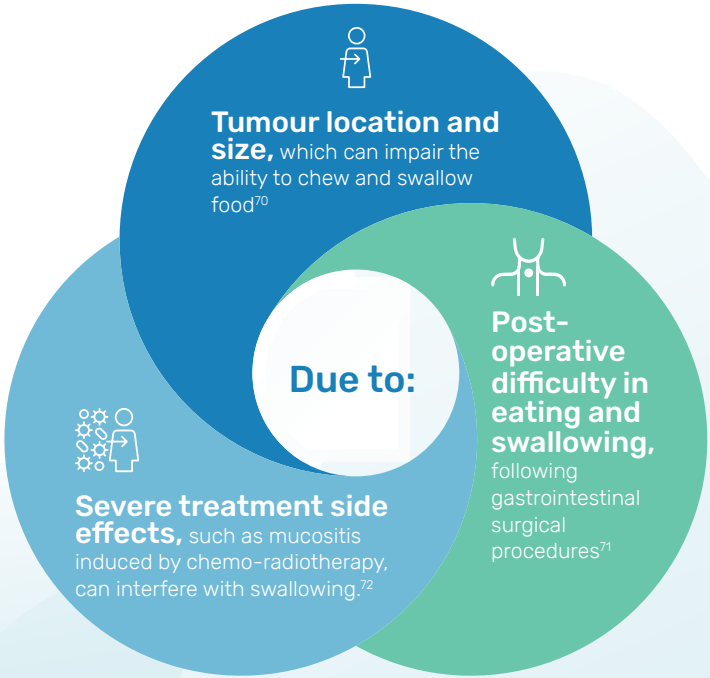
Bolus consistency

Adjusting bolus consistency, by modifying texture and thickness, is a common technique to help patients with dysphagia swallow safely. **It prevents fluids from entering the lungs, slows down the liquid transit rate, and enhances sensory awareness.**[66-68]

Length of nutritional intervention

Patients with dysphagia due to H&N cancer may require **long-term swallowing rehabilitation.**[66-68]

Tube feeding may be necessary for some patients with cancer to meet their nutritional needs[40]



ESPEN Guidelines recommend:

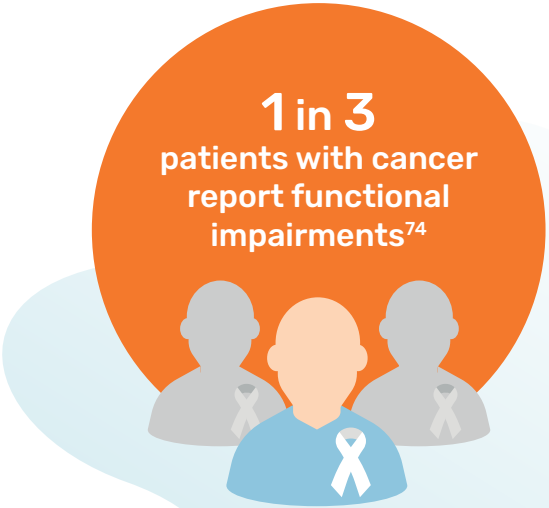
To ensure **adequate nutritional intake** to **avoid nutritional deterioration, maintain intake and avoid RT interruptions** in patients with H&N, thorax and GI cancer.[40]

To initiate enteral tube feeding in patients with **radiation induced severe mucositis** or in **obstructive tumors of the H&N or thorax**[65]

To initiate **nutritional support** in the **perioperative period** for patients **unable to eat for 5 days** or **who cannot maintain >50%** of the recommended intake for 7 days[40,71]

Nutritional support is beneficial during the cancer recovery and post-recovery phases

- Cancer and its treatment can lead to muscle loss, which can affect **up to 90%** of patients. After treatment, nutritional support focusing on rebuilding muscle mass can support patient recovery.[21]
- During anti-cancer treatment, the rate of **muscle decline can be up to 24-fold more rapid** compared to healthy ageing adults[73]
- Patients with cancer who are in post-treatment recovery require nutrition which would support maintenance of optimal health and quality of life, as well as expedite recovery and the return to a normal diet.[4]



Patients with cancer can have specific nutritional needs

Cancer patients have specific nutritional needs

ESPEN/ESMO guidelines recommend:[40,65]

- High protein
- High energy
- Adequate micronutrients, in particular vitamin D
- Omega-3 fatty acids

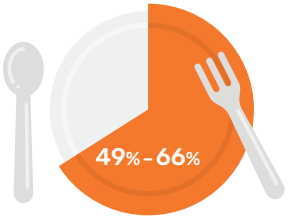
and

individual patients may have specific requirements to support adherence to medical nutrition

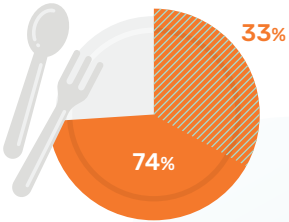
- Tailor-made or sensory adapted flavors to improve palatability in patients with sensory changes[75]
- Different flavors to provide variety
- Small volume to improve compliance in patients with low appetite[76]

ESPEN, European Society for Clinical Nutrition and Metabolism; ESMO, European Society for Medical Oncology.

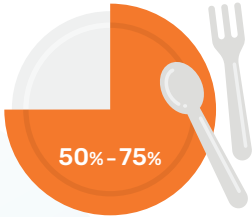
Reduced food intake in patients with cancer is associated with micro- and macronutrient deficiencies[77-81]



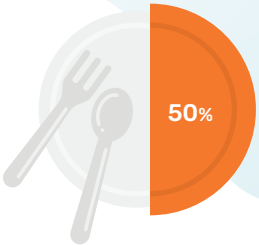
49%–66% of patients **do not consume sufficient protein** according to recommendations[82-84]



Up to **74%** of pateitns have **vitamin D inadequacy** and up to **33%** have a **vitamin D deficiency**[79-80]



Patients have a **50%–75% gap** between micronutrient intake and the RDA[81]



Patients **often fail to reach 50% of the RDA** for potassium, calcium, vitamin D, folate and vitamin C[81]

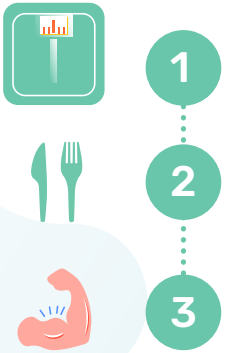
RDA, recommended dietary allowance.

Guidelines recommend early assessment of nutritional risk in patients with cancer

- ESPEN and ESMO guidelines recommend routine screening to detect nutritional imbalances in patients with cancer.[40,65]
- Nutritional intake, weight changes, body mass index, muscle mass and systemic inflammation should be evaluated.[31,32]
- Routine screening for malnutrition allows early nutritional intervention and prehabilitation strategies, in patients with cancer.

Nutritional risk assessment can be quick and easy

Three simple questions to ask your patient:*[85]



1. **Have you lost weight unintentionally (5-10% or more) in the last 3-6 months/ since your last consultation?**
2. **Have you eaten less than usual in the last week/since your last consultation?**
3. **Have you lost your strength or feel weaker than usual/ since your last consultation?**

If 'yes' to any of these questions, then intervene

Refer to a nutrition expert for screening/assessment and nutritional counselling. Patient may need medical nutrition intervention.

ESPEN, European Society for Clinical Nutrition and Metabolism; ESMO, European Society for Medical Oncology.

*A Pragmatic, Evidence-Based Protocol (PRONTO - PROtocol for NuTritional risk in Oncology) for the early identification of nutritional risk among patients with cancer.

Specific nutritional needs for patients with cancer are recommended by international guidelines

ESPEN and ESMO recommend a high-energy diet rich in proteins, micronutrients (vitamin D in particular) and omega-3 fatty acids, for patients with cancer.

ESPEN guidelines on nutrition in cancer patients (2017)[40]		ESMO guidelines on cancer cachexia in adult patients (2021)[65]
25–30 kcal/kg/day in all patients with cancer, if energy expenditure is not measured directly	Energy	**25–30 kcal/kg/day** to maintain nutritional status, adjust regimen as required
>1 g/kg/day and if possible, up to **1.5 g/kg/day** in all patients with cancer	Protein	At least **1.2 g protein/kg/day** should be provided to patients with cancer
Vitamins and minerals be supplied in amounts approximately equal to the RDA	Micronutrients	
In patients with advanced cancer undergoing chemotherapy, use supplementation with long-chain omega-3 fatty acids or fish oil to stabilize or improve appetite, food intake, lean mass and body weight	Omega-3 fatty acids	Offer patients receiving chemotherapy, radiotherapy or chemoradiotherapy high-protein ONS enriched with omega-3 to increase body weight, attenuate loss of lean body mass and improve quality of life

A diet abundant in protein, energy, micronutrients and omega-3 fatty acids is guideline-recommended for patients with cancer

ESPEN, European Society for Clinical Nutrition and Metabolism; ESMO, European Society for Medical Oncology; ONS, oral nutritional supplements; RDA, recommended dietary allowances.

Guideline recommendations for protein intake in patients with cancer

Inadequate protein intake is associated with poor clinical outcomes and compromised quality of life.

Low muscle[86,87]

Cancer-related fatigue[84,88]

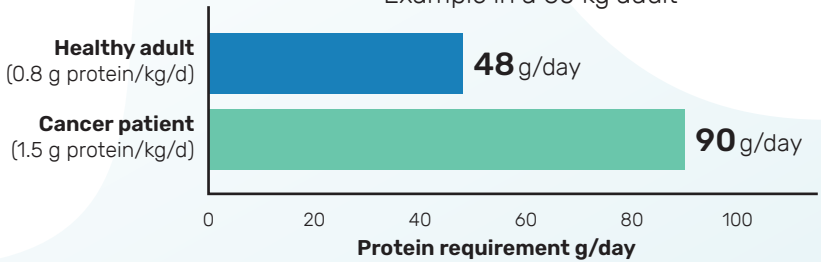
Survival[84,89]

ESPEN and ESMO guidelines recommend increased protein intake during cancer treatment.[40,65]

ESPEN & ESMO protein recommendations[40,65]

>1 g/kg/day and if possible, up to **1.5 g/kg/day** in all patients with cancer

Increased protein requirement +42 g/day:
Example in a 60 kg adult



For **patients with cancer**, the **dietary need for protein is higher** than for healthy adults

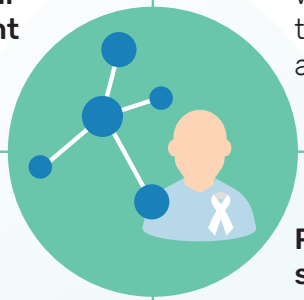
ESPEN, European Society for Clinical Nutrition and Metabolism; ESMO, European Society for Medical Oncology.

Protein intake is essential at every stage of the cancer journey

Patients with cancer need up to 2x as much protein as healthy Adults[40,65], but often eat less

Protein is important for numerous structural and functional purposes. It is **essential for growth and repair of the body and plays an important role in immune functioning.**[90,91]

Low muscle mass can happen at any stage of cancer and is associated with severe side effects of cancer treatment, poorer surgical outcomes and shorter survival time.[21]



In patients with cancer, protein needs are increased as a result of abnormalities in protein metabolism, whereby protein breakdown is increased and protein synthesis rates are reduced, leading to muscle loss.[92]

Preserving adequate nutritional status and muscle can support outcomes during anti-cancer treatment. Therefore, prompt nutritional support to address energy and protein needs is recommended along the oncology journey.[40,65]

Enhance patient outcomes with high protein supplementation

If food intake is not sufficient to meet energy and protein needs, oral nutritional supplements (ONS) can support nutritional intake.[40,65]

High-protein ONS in patients with cancer has demonstrated improvement in:

- Body weight and muscle mass[28,93]
- Length of stay[29]
- Tolerance to anti-cancer treatment[22,94]
- Post operative complications[28,29]
- Radiotherapy tolerance[22]

Optimizing nutrition strategies to better support cancer care

- Early assessment of specific nutritional needs in a cancer patient's journey allows implementation of strategies to minimize the risk of malnutrition.[40,65]
- Optimal protein intake per guideline recommendations is necessary in improving clinical outcomes.[48,65]
- Nutritional intervention should consider sensory alterations due to cancer treatment.[48]
- Omega-3 PUFAs are known to have anti-inflammatory properties and ESPEN recommends the use of supplementation with omega-3 fatty acids to stabilize or improve appetite, food intake, lean mass and body weight.[40]

ESPEN, European Society for Clinical Nutrition and Metabolism; PUFA, polyunsaturated fatty acids.

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