
Review Article

Nutritional Intervention Plays Essential Role in Cancer Patients

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This mini-review aims at highlighting the role of nutritional intervention in cancer patients. Malnutrition and weight loss are common and potentially lethal conditions in cancer patients. It is important to identify cancer patients at risk to minimize weight loss and prevent cancer cachexia development. Cancer cachexia is a multiorgan syndrome associated with multiple metabolic aberrations. Cancer treatment including surgical and chemo-radiotherapy may contribute to complications such as anorexia, dysphagia, and mucositis, leading to poor nutrient intake. Previous studies have shown that nutritional intervention plays a crucial role in improving the clinical outcomes, nutritional status and quality of life of this patient population. Early nutritional intervention is recommended for better survival, shortened hospital stay, and improved quality of life. Further studies are needed to gain deeper insight into the role of nutritional support and provide evidence-based recommendations regarding the use of immune-enhancing nutrient supplementation in cancer patients.

Key words: nutritional intervention, nutritional screening, cancer, cachexia

Introduction

Cancer is a leading cause of death worldwide that accounts for approximately 8.2 million cancer-related mortalities in 2012 according to the World Cancer Report in 2014. It has been reported that nutritional status greatly affected outcomes in cancer patients.¹ Since nutrition and weight loss are considered poor prognostic indicators in cancer patients,² nutritional assessment is essential for identify-

ing potential candidates for nutritional support. Nearly 30-85 percent of cancer patients typically present with malnutrition which could contribute to adverse outcomes such as reduced survival rate, higher risk of complications, lengthened hospital stay, and decreased life quality.³ The prevalence of weight loss ranges from 8-84%, depending on cancer type, stage and treatment.⁴ Lung, pancreas, and upper gastrointestinal tract cancers are more associated with body weight loss compared to breast and lower gastrointestinal tract cancers. Unin-

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tentional weight loss more than 10% of the initial weight in recent 6 months occurred in 15% patients at the time of diagnosis. Longitudinal studies have demonstrated that the prognosis for cancer patients with weight loss is worse than that for patients with stable body weight.⁵

Patients with stable body weight

Early nutritional intervention should start from the time of diagnosis and continue throughout the course of treatment to allow timely recognition and treatment of cancer-related malnutrition, weight loss, or cancer cachexia.⁶ Over the last few decades, the term cachexia is preferred for cancer patients to the term malnutrition. Cancer cachexia, a specific form of cancer-associated malnutrition, is the main cause of increased mortality and morbidity at the advanced stages of diseases. Weight loss-associated malnutrition in cancer patients is mostly caused by poor food intake resulting from anorexia, dysphagia as well as inability to digest or absorb nutrients.⁷ These symptoms can be reversed by adequate caloric intake and appropriate nutritional support but the outcomes may be different in cachectic patients. Cachexia is a multiorgan syndrome associated with multiple metabolic aberrations. Optimal nutritional support basically aims at preventing further deterioration of patients' general status or delaying the onset of cancer-cachexia syndrome. For successful outcome, nutritional support needs to be combined with anabolic or anti-catabolic agents at an early stage of treatment for cancer patients.⁸

The term cachexia is derived from the Greek words *κακός* and *hexis*, meaning "bad condition". Cancer cachexia was defined as a multifactorial syndrome characterized by an ongoing loss of skeletal muscle mass (with or without loss of fat) that cannot be fully reversed by conventional nutritional support, thereby leading to progressive functional

impairment as well as a negative protein and energy balance caused by a combination of reduced food intake and abnormal metabolism. Although our understanding of cachexia has progressed over the past decade, there was no consensus regarding its definition, diagnostic criteria and classification. To develop a practical clinical approach, a panel of experts in clinical cancer cachexia research attempted to reach a consensus by organizing different focused groups and adopting the Delphi approach.⁹

Fearon et al. have defined and classified cancer cachexia as a weight loss greater than 5% over the past 6 months, a BMI less than 20 together with any degree of weight loss greater than 2%, or appendicular skeletal muscle index consistent with sarcopenia (i.e., another wasting syndrome) and weight loss of more than 2%. Besides, three stages of cancer cachexia are established, including precachexia, cachexia and refractory cachexia (Fig. 1).

Moreover, cancer patients undergoing anticancer therapies may sustain more complications and side effects that would adversely affect clinical outcomes. As mentioned above, through radiotherapy, chemotherapy or even surgery, patients may experience anorexia, alterations in smell and taste, early satiety, nausea, vomiting, mucositis, diarrhea, fatigue, pain, xerostomia, dysphagia, and other side effects.¹⁰ The appearance of these symptoms further aggravates the malnutrition status. Consistently, nutrition intervention has been shown to improve outcomes in patients with cancer cachexia receiving chemotherapy.¹¹ It has been reported that the effectiveness of cancer treatment, including prognosis and quality of life, could be enhanced if the patient is well-nourished with adequate nutrient intake.^{12,13}

Nutritional Screening

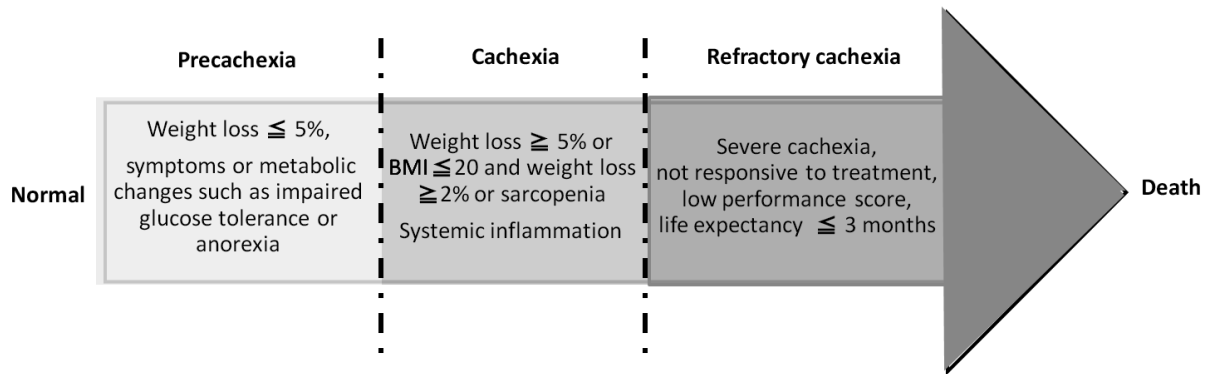


Fig. 1 Stages of cancer cachexia. (Adapted from Fearon et al.⁹)
Cancer cachexia is a continuum, with three stages of clinical relevance.
BMI represents body mass index.

A key step in the management of cancer patients' nutritional status is nutritional screening.¹⁴ An appropriate nutritional screening provides effective nutritional intervention for those with real needs. Although traditional laboratory tests could be used to assess patients' nutrition status, they were time-consuming and expensive. Nutritional screening is usually completed by the healthcare professional who first contacts the patients (e.g., nurse, physician) rather than the dietitian, whereas patients at high nutrition risk should be referred to registered dietitian for further evaluation. Several convenient nutrition screening tools have been developed to identify the need for nutritional intervention in patients, such as NRS-2002,¹⁵ patient-generated subjective global assessment (PG-SGA),¹⁶ and malnutrition universal screening tool (MUST).^{17,18} MUST screening system is commonly used with ease and accuracy in clinical settings in Taiwan. PG-SGA, which is completed by patient or caregiver and also registered dietitian, has been adapted for use in cancer patients.

Nutritional Interventions

Referral of a cancer patient with high nutritional risk to a registered dietitian helps in early nutritional assessment and implementa-

tion of a suitable nutrition care plan according to the stage of disease.¹⁹ Cancer cachexia is a vicious cycle. Cancer patients are associated with presence of multiple metabolic abnormalities in energy expenditure and nutrient metabolism. Besides, due to increased release of pro-inflammatory cytokines (e.g., TNF- α , IL-1, IL-6, IFN- γ), systemic inflammatory response and hyper-metabolism are usually observed in cancer patients. Furthermore, surgery as well as chemo- and radiotherapy may contribute to reduced oral intake which could adversely affect the nutritional status. Therefore, in the presence of systemic inflammation and intake disturbances, energy intake is usually insufficient to meet energy requirements.

To date, nutrition intervention plays an important role in weight management in cancer patients, even though nutritional status and outcome vary among patients with different types of cancer.^{20,21} A research involving 179 patients with different types of cancers who received anticancer treatment has been conducted in a medical center in Taichung.²² It has concluded that nutritional education can increase cancer patients' nutrient intake and further improve nutritional markers through follow-up by a qualified dietitian. Hence, studies have identified that nutritional interventions positively improve clinical outcomes, delay the onset of anorexia-cachexia syndrome, and

attain better prognosis.^{23,24} For patient groups undergoing radiotherapy for cancer treatment, randomized controlled trials have shown that nutrition counseling could improve nutrition intake, nutritional status, and quality of life.^{25,26} Perioperative nutrition interventions also seem beneficial to cancer patients at significant risk of malnutrition.²⁷⁻²⁹

In a prospective randomized controlled trial recruiting patients with head and neck cancers referred for radiotherapy, increased energy and protein intake and ameliorated radiotherapy-associated side effects have been observed in patients receiving dietary counseling.³⁰ Nutritional intervention should be used to increase dietary intake and to prevent therapy-associated weight loss and interruption of radiotherapy.^{23,26,31} Another study in Kaoshiung also suggested that head and neck cancer patients with BMI < 23 should consider early nutrition counseling before cancer treatments for better clinical outcomes.³² Optimal means of enteral feeding in the head and neck cancer patients receiving radiotherapy and/or chemotherapy have been discussed in some literature reviews.³³

There are no gold standards on nutrition requirements for cancer patients.^{8,24} From the Guidelines for Enteral Nutrition from the European Society for Clinical Nutrition and Metabolism (ESPEN), total energy expenditure can be assessed by using the actual body weight in non-obese patients. Ambulant patients may need 30-35 kcal/kg BW/day, whereas 20-25 kcal/kg BW/day may be needed for bedridden patients.²⁴ There are few and inconsistent data regarding the effects of cancer treatments on energy expenditure. Protein supply ranges from a minimum of 1 g/kg/day to a target of 1-2 g/kg/day.⁸ Effectiveness of high protein intake and adequate energy intake should both be taken into consideration. The goal of nutrition intervention is weight maintenance, while the goal of nitrogen supply is to limit muscle catabolism.

Although no evidence has clearly shown the benefit of a “specific” nutritional support, alternative nutritional support should be considered if the anticipated nutrient requirements cannot be achieved with oral intake.²⁴ Some studies have demonstrated that nutritional counseling or oral nutritional supplements could improve energy and protein intake, resulting in significantly better survival rate and life quality.³⁴ For those undergoing chemo-/radiotherapy or surgery, it has been suggested that intensive dietary counseling and oral nutritional supplements are useful in preventing therapy-associated weight loss.³⁵ Patients with severe nutritional risk have been reported to benefit from perioperative nutritional support for 7-14 days, but the potential benefit must be weighed against the potential risks of delaying the operation.³⁶

Studies as summarized by Bozetti, have looked at the benefits of nutrition support in cancer patients with or without nutritional supplements.⁸ Unfortunately, many of these studies adopted diverse methodologies which limited the ability to determine the optimal dosage and initiation timing for giving immune enhancing supplementations. Variations in cancer types, stages, and treatments may also influence clinical outcome for patients taking the same oral nutrition supplements. The American Society for Parenteral and Enteral Nutrition (ASPEN) Guidelines state that immune-enhancing enteral formulas containing mixtures of arginine, nucleic acids, and essential fatty acids may be beneficial in malnourished patients undergoing major cancer operations.³⁶ Also, ω -3 fatty acid supplementation may help stabilize weight in cancer patients on oral diets experiencing progressive and unintentional weight loss.³⁶ On the other hand, ESPEN guidelines state that evidence is contradictory/controversial and not conclusive enough to support an improved nutritional status.²⁴ Although the clinical benefit of immune-enhancing supplementation has been

reported, this issue remains controversial. Future studies are required, including randomized clinical trials, to provide sufficient scientific evidence.

Summary

Nutrition is a major issue in clinical oncology. According to the guidelines provided by The Society of Integrative Oncology (SIO) in 2009, patients who wish to use nutritional supplements are recommended to consult trained professionals to integrate complementary medicine into cancer care.³⁷ Although there were insufficient data to support the use of immune enhancement formulas, intensive dietary counseling combined with nutritional supplements may increase nutrient intake and improve quality of life in cancer patients.

It is well documented that nutrition intervention plays crucial roles in many aspects of cancer treatment, although the underlying mechanisms are not fully understood. In managing patient's nutrition status, nutrition professionals should be included in the oncological team to optimize cancer treatment. Nutrition intervention should be individualized in cancer patients to achieve appropriate energy and protein intake as well as minimize weight loss following close interactions and in-depth discussion between physician and dietitian.

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