

How much can a cancer patient eat and how to calculate it – a dietitian’s point of view. Collaboration between doctor and dietitian

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Malnutrition in cancer patients is a severe clinical problem. One of the factors determining nutritional status is nutritional intake. The ability to provide adequate oral nutrition in cancer patients is mainly determined by the location and advancement of the disease, the type of oncological treatment, as well as the severity of the side effects of the therapy. Food intake is often reduced in cancer patients, leading to weight loss. Assessment of the nutritional intake requires a unique approach due to various limitations and conditions that do not occur in healthy people and the frequent deficiencies of multiple nutrients. In the context of preventing and treating malnutrition, cooperation between a doctor and a dietitian is crucial. Dietary counselling is the first step of nutritional intervention and can be offered to most patients. According to The European Society for Clinical Nutrition and Metabolism (ESPEN) recommendations, dietary counselling supported by oral nutritional supplements has a recommendation grade of “A” according to Evidence Based Medicine (EBM). Success in maintaining or improving the patient’s nutritional status depends on efficient cooperation between the doctor and dietitian. This publication aims to present the tasks of a dietitian and the principles of collaboration with a doctor in the nutritional care of cancer patients.

Key words: malnutrition, nutritional assessment, clinical nutrition, dietary counselling

Malnutrition in cancer patients

Malnutrition is a severe clinical problem that may affect from 18 to 90% of cancer patients. Weight loss often precedes the diagnosis of the disease and is one of its symptoms. Patients with cancer of the head and neck, upper gastrointestinal tract (esophagus, stomach, pancreas), and lungs are most at risk of developing malnutrition. Patients with these cancers are characterized by moderate to severe malnutrition at the time of diagnosis [1, 2]. Malnutrition has several consequences

that influence the course and effect of oncological treatment. The implications of both primary and secondary malnutrition are an increase in the frequency of complications (surgical and infectious), an increase in the duration of hospitalization, treatment costs, and mortality [3].

The development and exacerbation of hospital malnutrition are influenced not only by poor quality hospital diet or numerous diagnostic procedures where the patient must fast but, above all, by not undertaking any nutritional intervention

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in patients who require it or undertaking it too late. Therefore, patients who lose more than 5% of body weight should have their nutritional status assessed when diagnosed with cancer. If malnutrition or its risk is diagnosed, appropriate nutritional intervention should be initiated. The nutritional status assessment should be repeated during active treatment and palliative care [4].

Determining indications for particular types of nutritional intervention and the schedule of follow-up visits are crucial elements of cooperation between a doctor and dietitian.

Assessment of nutritional status

Each patient at high risk of malnutrition (cancer of the head and neck, gastrointestinal tract and lungs) or with a current, unintentional weight loss of >5% at the time of cancer diagnosis should have their nutritional status assessed. Nutritional status should be assessed regularly throughout the entire oncological treatment period. We use screening and in-depth methods to evaluate the nutritional status [1, 4].

The Regulation of the Minister of Health of January 1, 2012, imposes on Polish hospitals the obligation to perform screening assessment of the nutritional status of all hospitalized patients (except for the hospital emergency department, ophthalmology, otolaryngology, allergology, orthopedics and traumatology departments if hospitalization lasts less than three days, as well as in the case of hospitalization <1 day). The nutritional risk screening 2002 (NRS) and subjective global assessment (SGA) scales are used to assess the risk of malnutrition [5]. The NRS 2002 scale is usually used in clinical practice because it is shorter and more accessible to perform. It considers the patient's general condition, treatment and comorbidities, weight loss over the last 3–6 months, and daily coverage of individual energy needs.

In patients whose screening assessment indicates malnutrition or the risk of malnutrition, an in-depth assessment of the nutritional status and initiation of appropriate nutritional intervention are required. Methods used for in-depth assessment of nutritional status are listed below [6]:

- anthropometric measurements (body weight, body height, body mass index [BMI], thickness of the skinfold over the triceps muscle, arm muscle circumference, measurement of muscle strength),
- body composition assessment (including using electrical bioimpedance, computed tomography, magnetic resonance imaging, densitometry),
- biochemical tests (most often determining the concentration of albumin, prealbumin, transferrin, C-reactive protein, nitrogen balance and the total number of lymphocytes),
- assessment of demand for energy, macro- and micronutrients.

Criteria for diagnosing malnutrition

Since 2018, by the Global Leadership Initiative on Malnutrition (GLIM) consensus, we diagnose malnutrition according to

the following criteria (at least one phenotypic and etiological criterion must be met) [6]:

1. Phenotypic criteria:
 - weight loss >5% in 6 months or >10%, beyond 6 months,
 - reduced body mass index BMI < 20 kg/m² if <70 years or BMI < 22 kg/m² if >70 years of age. For the Asian population: BMI < 18.5 kg/m² if <70 years or BMI < 20 kg/m² if >70 years of age,
 - reduced muscle mass index determined using a validated technique for measuring body composition, e.g. bioelectrical impedance (BIA), dual-energy X-ray absorptiometry (dual energy X-ray absorptiometry [DXA]).
2. Etiological criteria:
 - reduced food intake and/or food absorption disorders ≤50% of estimated requirements >1 week, or any reduction for >2 weeks, or any chronic gastrointestinal (GI) condition that adversely impacts food assimilation or absorption,
 - inflammation – chronic inflammation associated with chronic disease, trauma, or acute conditions.

The GLIM algorithm is acknowledged as the gold standard for diagnosing malnutrition.

Assessment of nutritional intake in cancer patients

One of the factors determining the nutritional status of cancer patients is the nutritional intake, which should be assessed in both quantitative and qualitative ways. In cancer patients, oral intake is mainly determined by the disease's location and stage, the treatment type, and the severity of the side effects of the therapy used [7]. It is estimated that energy intake lower than 25 kcal/kg/day is associated with a high risk of malnutrition. Therefore, oral intake should be assessed at specified intervals so that it is possible to determine and adapt the optimal diet to the current clinical situation [8, 9].

According to the multi-center study "Nutrition Day", conducted using a one-day assessment of the nutritional status in over 300 European hospitals, hospital meals do not cover the energy needs of hospitalized patients. The study's authors reported that the energy intake of 43% of respondents was less than 1,500 kcal per day [10].

Methods for assessing nutritional intake

Nutritional intake assessment methods are diverse due to the multi-thread nature of this concept and provide information on the qualitative and quantitative value of consumed foods. One of the popular methods of assessing individual oral intake is the 24-hour dietary recall method. The patient is asked what types and quantities of products, dishes and drinks were consumed the previous day or days preceding the examination. When assessing the size of consumed portions, photo albums of products and dishes are used, which present the typical appearance of dishes and products of appropriate weight.

The data obtained are useful for estimating the diet's average energy and nutritional value.

Another method used in dietitian practice to assess nutrition is current dietary records. The method of ongoing recording involves the patient writing down all consumed foods over 1–14 days using home measurements (e.g. a spoon, slice, glass) or using the weight from packaging. When noting, the patient should pay attention to the percentage of fat in the product, e.g. milk – 0.5% or 3.2%, and sugar addition. The diet recording method is easy to conduct and does not require memory, such as a nutritional interview. The most frequently used is a three-day current intake record, but extending it to 7 days makes the average daily intake more realistic.

Crucial to adequately analyzing nutritional intake is to include oral nutritional supplements and single nutrients (liquid formulas, powders, tablets), which are not classified as food but may be an important source of energy and nutrients. The actual (real) energy and protein consumption must be compared to the calculated requirements of the patient and applicable standards. The data obtained from both methods are entered into computer databases, based on which specialized nutritional programs calculate the energy value of daily food rations, the content of total protein, total fat, cholesterol, types of fatty acids, total carbohydrates, dietary fiber, essential vitamins and minerals. Using these same IT devices, the dietitian may compose dietary advice with an adequate menu which is complete regarding nutritional value.

Although the above methods are widely used by dietitians in the individual assessment of patients' nutrition, there still needs to be an indication in the literature of what strategies to use in oncological patients. According to the study authors' many years of experience, the method of 24-hour interview or ongoing recording is used and works well in outpatients under the care of a dietitian. Using the methods described above in hospital care is too time-consuming and challenging to implement on a large scale.

According to Gronowska-Senger et al., in hospitals, it is possible to estimate the size of consumed portions using the so-called plate diagram sheets (fig. 1). The diagram indicates how much from the portion of the dish/product the patient

consumed during the meal (0, 25, 50 and 100%). The energy value may be underestimated when the subjects consume less than 50% of the served portion. The method is considered valuable and is recommended in clinical practice to identify people with low caloric intake.

There are also attempts to record consumption by taking photos or filming. An example is the Wellnavi method, which involves taking pictures of meals eaten during the day with a mobile phone and sending the image to a dietitian for further analysis. Because the meals contain invisible added products, subjects complete a short questionnaire about their consumption. For technical reasons, these methods are not yet widely applicable [11, 12].

Analysis of the nutritional intake allows us to identify the subjects who do not consume the recommended amount of energy and protein. The next step is to decide how to increase the supply of macro- and micronutrients. The gap between actual and estimated caloric requirements may be covered with standard or fortified food, food for special medical purposes or artificial nutrition.

Energy, protein and micronutrient requirements in oncological patients

The standard oral diet of an oncological patient should cover the need for energy, protein, micronutrients and water. Depending on the patient's current clinical situation, diets may require modifications to the essential ingredients supply. Any restrictive elimination diets are not recommended. The table below (tab. I) shows the demand for cancer patients by the ESPEN recommendations [4].

Nutritional support for patients with reduced energy and protein intake

Offering dietary counselling to cancer patients is the easiest option and the cheapest method to improve and maintain proper nutritional status. Patients at nutritional risk or with weight loss that began unintentionally must be referred to a dietitian regardless of their current body weight. It is recommended that counselling be continued during active treatment, as well as for patients treated with palliative intent and for patients after completion of oncological therapy to support healing and as a form of secondary prevention. According to the ESPEN

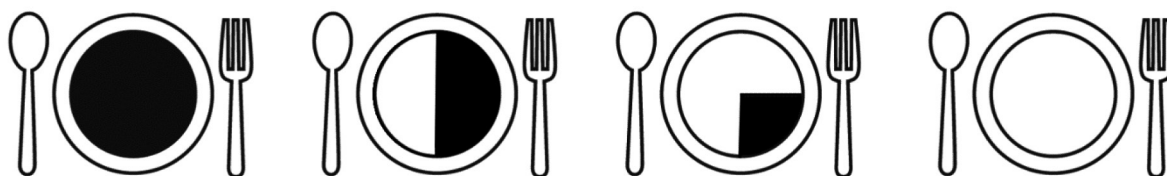


Figure 1. Plate diagram sheets

Table I. Energy demand and essential dietary components

energy	25–30 kcal/kg body weight. In cachectic patients with normal body weight, the requirement is calculated based on the current body weight, and in obese patients, it is the ideal body weight
protein	protein above 1.2 g/kg body weight/day, on average 1.5 g/kg body weight/day, maximum 2.0 g/kg body weight/day
fats	in patients with weight loss and concomitant insulin resistance, it is recommended to increase the amount of energy from fats (up to 50%) by the reduction the amount of energy from carbohydrates
vitamins and trace elements	not exceed the daily requirement RDA – recommended daily allowance and AI – adequate intake
water	30 ml/kg body weight/day

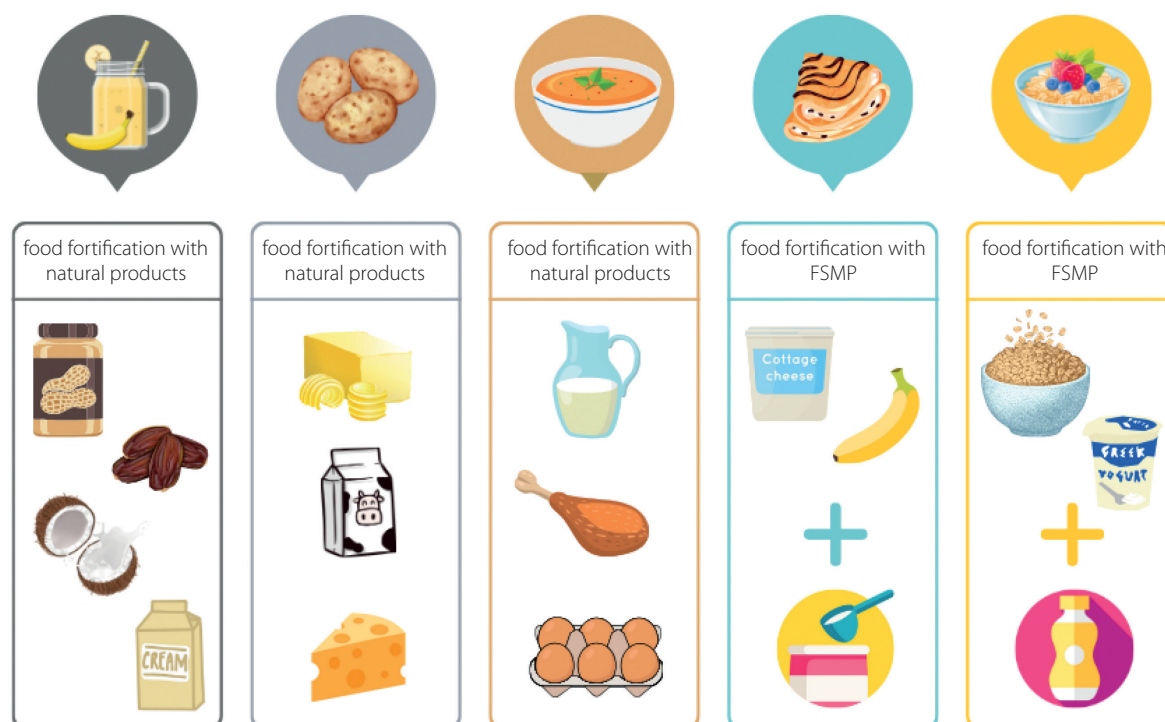


Figure 2. Examples of food fortification

recommendations for oncological patients, dietary counselling supported by oral nutritional supplements has an undeniable recommendation for use (strength of recommendations – strong, level of evidence – moderate) [4].

In patients with reduced energy and protein intake, it is recommended to fortify the diet, i.e. increase its nutritional value by [1] (fig. 2):

- the addition of food products with a natural, high energy density such as butter, vegetable oils, sweet cream, mascarpone cheese, high-fat yoghurts, coconut milk, avocado, egg yolk and egg white, meat, groats, cereals, ground nuts, honey, chocolate,
- addition of complete and incomplete food for special medical purposes (FSMP).

Food fortification should be carried out under the supervision of a dietitian for it to be effective. Incorrect food fortification may disturb the proportions of nutrients in the diet and hinder the absorption of some of them.

Concomitant anorexia, feelings of early satiety, and taste and smell disorders also contribute to reduced food intake. In such a situation, additionally recommended are [13]:

- small-volume meals, served frequently, approximately 6–8 times a day,
- including partially mixed meals in the menu (including cocktails, cream soups, mousses, pastes, jellies, fruit and vegetable purees, soft meatballs in sauce),
- drinks served between meals,
- adding FSMP (chilled, low osmolarity) to the diet,
- seasoning meals according to the patient's preferences: fresh herbs, lemon, lime, balsamic vinegar,
- meat is better tolerated in marinades with fruit (e.g. apple puree, cranberry sauce), as well as in marinades made from cream, coconut milk or lemon juice,
- to stimulate taste, it is recommended to include cold foods between meals: fruit sorbets, ice cream, sucking frozen pineapple cubes or frozen fruit.

Nutritional support – dietary part

An essential element of assessing the patient's nutritional intake is an interview conducted by a clinical dietitian. The Maria Skłodowska-Curie National Research Institute of Oncology in Warsaw adopted the following standards for the work of a dietitian in the field of collecting nutritional information:

- what the patient ate that day (breakfast, second breakfast, lunch, dinner, snacks),
- what the patient drank during and between meals,
- type of food products used, fat content (e.g. in dairy products), added sugar and culinary techniques used (e.g. cooking, baking, frying),
- size of portions of meals consumed – using household measures (e.g. spoon, cup, plate) or using plate diagram sheets (the so-called plate system),
- whether and what supplements and food for special medical purposes and in what doses the patient uses.

The conclusions from the interview, i.e. the answer to the question of how much (energy and protein) the patient eats and how it relates to the current demand, are passed on to the attending physician by the dietitian. Based on a comprehensive assessment of the nutritional status, diet, information

on accompanying symptoms and the advancement of the disease (cancer type, stage and treatment plan), the doctor-dietitian team decides on the type of nutritional intervention (fig. 3).

The method of choice is constantly feeding through the digestive tract. Dietary counselling and the selection of FSMP are the competencies of a dietitian. If oral nutrition with regular food products and FSMP support fails to cover energy and protein needs, artificial nutrition should be considered. The method of choice is enteral nutrition unless there are contraindications. When enteral nutrition is impossible, insufficient or intolerable, parenteral nutrition should be considered [14].

Nutritional support – the physician's role and cooperation with a dietitian

Collaboration between a doctor and a dietitian is crucial in preventing and treating malnutrition. That said, other specialists may also be necessary: a nurse, a speech therapist, a physiotherapist, a psychologist or a social worker. Multidisciplinary teams aim to improve treatment results and the patient's quality of life [15]. A decision-making algorithm is proposed below to describe a doctor's and dietitian's collaboration in managing nutritional care (fig. 4).

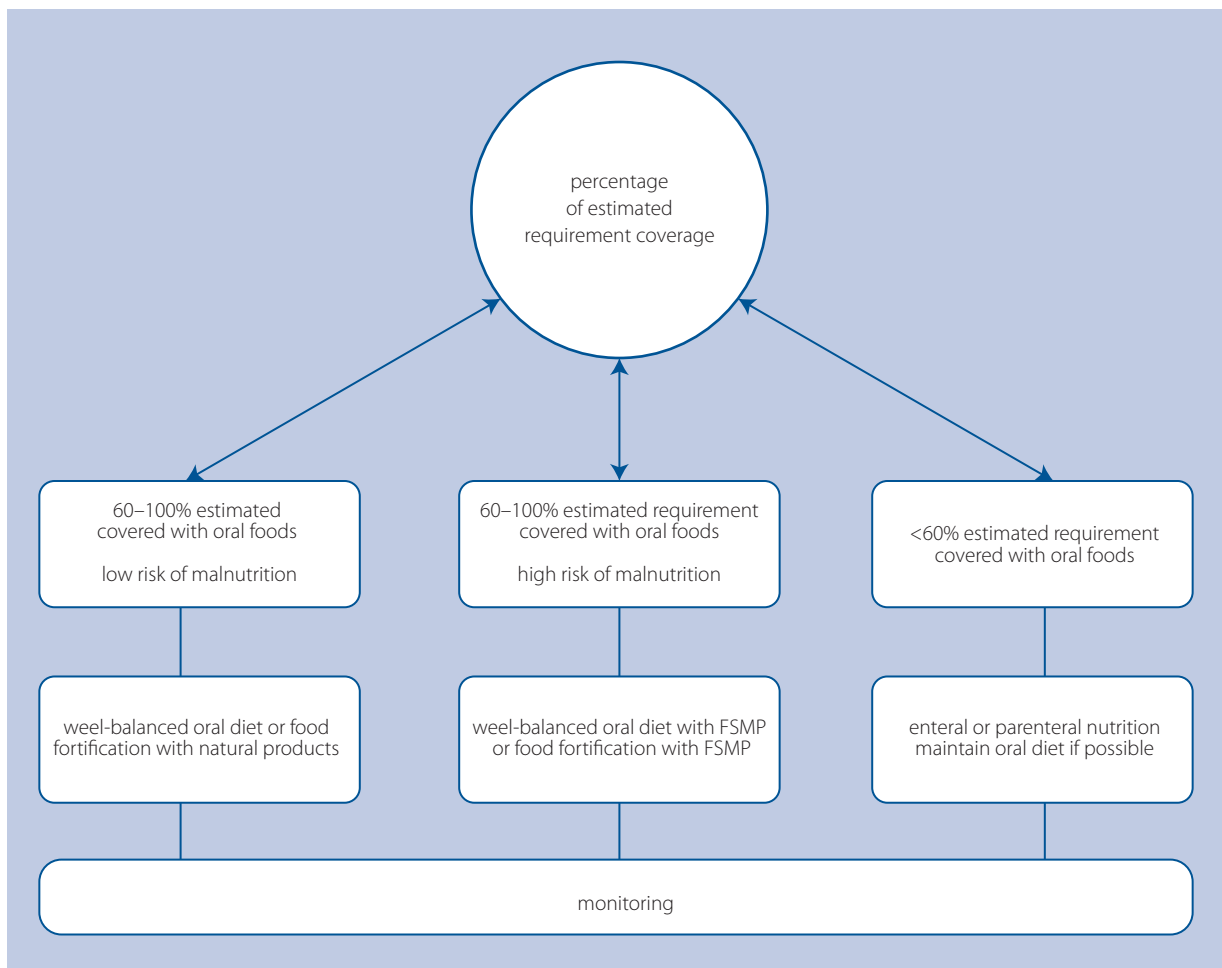


Figure 3. The decision-making flowchart. The type of nutritional intervention depends on the amount of energy, protein and other nutrients taken orally [1, 4, 13]

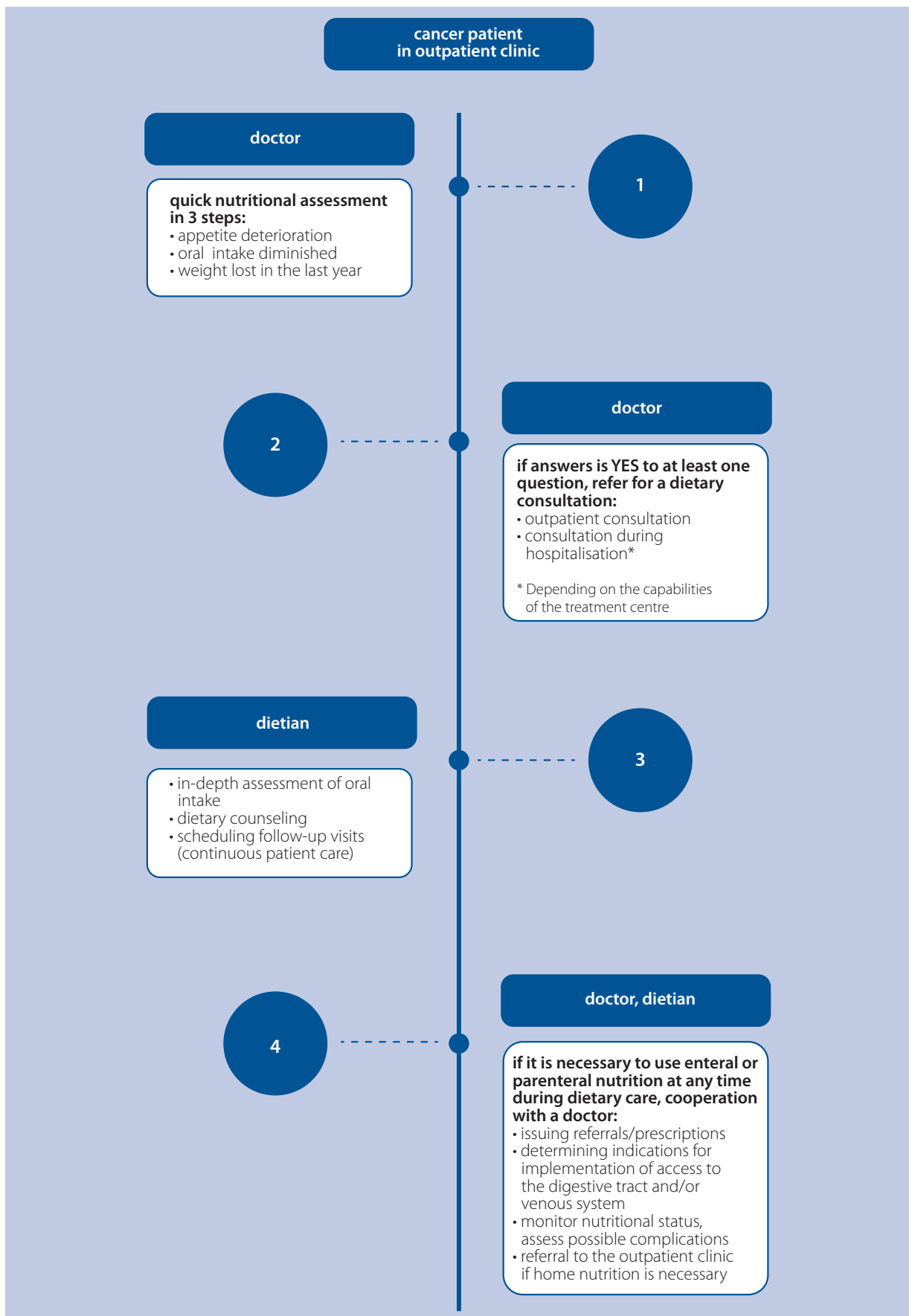


Figure 4. Decision-making algorithm describing cooperation between a doctor and a dietitian

Table II. Competency table of the Polish Society for Parenteral, Enteral Nutrition and Metabolism (POLSPEN) Nutritional Treatment Standards [14]

Specialist	Scope of competence
doctor	<ul style="list-style-type: none"> conducting a screening and in-depth assessment of the nutritional status development of a nutritional treatment plan and responsibility for the correct implementation of the therapy insertion and replacement of short and long-term artificial access to the gastrointestinal tract establishment and replacement of central and peripheral, short and long-term venous access issuing prescriptions, and referrals
dietitian	<ul style="list-style-type: none"> dietary and FSMP advice nutrition education of the patient and/or caregiver of the patient undergoing nutritional treatment screening and in-depth assessment of nutritional status establishing assumptions and monitoring the diet for inpatient and outpatient nutritional therapy patients

A constant dialogue between a dietitian and a doctor is necessary for nutritional care to be effective. Both professions are characterized by different professional competencies in malnutrition treatment, which are listed in table II [14].

Plenty of evidence in the literature shows that treatment outcomes can be improved by creating multidisciplinary nutrition teams. The introduction of a screening assessment of nutritional status by a dietitian increased the effectiveness of diagnosing malnutrition by 50–80% and, on average, shortened the hospital's stay by about three days [16, 17]. Moreover, multidisciplinary care reduces hospital admissions, the incidence of infectious complications and treatment costs [18]. A nutritional care program provided in patients with HNC during chemoradiotherapy by a doctor-dietitian team reduced the incidence of infectious complications and prevented drug dose reduction and the deterioration of patients' anthropometric and laboratory parameters [19].

In European medical care, a dietitian should be a part of the team planning oncological treatment. According to the European Food and Safety Association (EFSA's) recommendation, one dietician should care for 50 hospital beds [18, 20].

Article information and declarations

Author contributions

Agnieszka Surwiłło-Snarska – concept, manuscript writing.

Katarzyna Różycka – preparing tables and figures.

Ewelina Grochowska – manuscript writing.

Aleksandra Gazi – manuscript writing.

Emilia Motacka – manuscript writing.

Marta Dąbrowska-Bender – manuscript writing.

Anna Oleksiak – manuscript writing.

Aleksandra Kapala – concept, checking.

Conflict of interest

None declared

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