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► To cite this version:

Julien Taieb, Raëf Abdallah, Ronan Thibault, Patrick Pessaux, Pascal Artru, et al.. Nutrition support in pancreatic cancer: An expert statement on practical implementation of French guidelines. *Clinics and Research in Hepatology and Gastroenterology*, 2023, 47 (7), pp.102153. 10.1016/j.clinre.2023.102153 . hal-04164464

HAL Id: hal-04164464

<https://hal.science/hal-04164464>

Submitted on 11 Sep 2023

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Review

Nutrition Support in Pancreatic Cancer: An Expert Statement on Practical Implementation of French Guidelines

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Abstract

The European Society for Clinical Nutrition and Metabolism (ESPEN) guidelines, shortened in 2021, are widely used for providing the most suitable nutrition support to patients with cancer. However, there is a lack of specialized guidelines for different cancer types. In 2020, members of the French medical and surgical societies involved in digestive oncology, nutrition and supportive care developed the Thésaurus National de Cancérologie Digestive (TNCD) practice guidelines which are specific nutritional and physical activity guidelines for patients with digestive cancers. These guidelines were recently updated in 2022. This review discusses the French intergroup guidelines, specifically in the context of pancreatic cancer at different stages of the disease. Pancreatic cancer is highly prevalent in Europe, with an increasing worldwide incidence over the last three decades. In France alone, about 14,000 new cases of pancreatic cancer are reported annually. More than 60% of patients with pancreatic cancer reportedly experience malnutrition and other nutritional issues which are known to have a negative impact on quality of life, treatment tolerability, general morbidity, and mortality. Given that the recommendations of TNCD guidelines correlate to other guidelines like the International Study Group on Pancreatic Surgery (ISGPS; for the perioperative setting), ESPEN and Spanish Society of Medical Oncology (SEOM) guidelines, their use can be suitably applied in other European countries. This review discusses the recommendations issued by nutrition guidelines, the challenges with effective integration of nutrition support in oncologic treatment, and the proposed algorithms on patient care pathways for pancreatic cancer management in the clinical setting.

Keywords

pancreatic cancer, enteral nutrition, parenteral nutrition, physical activity, perioperative

Introduction

The European Society for Clinical Nutrition and Metabolism (ESPEN) guidelines determine the most suitable interventions for evaluating nutritional status and managing malnutrition in cancer patients. [1,2] However, the causes and severity of malnutrition vary significantly depending on the stage and type of cancer. The recently updated French intergroup guidelines, Le Thésaurus National de Cancérologie Digestive (TNCD) [3], on nutritional and physical activity management in patients with digestive cancers present a roadmap for diagnosing malnutrition and providing the best supportive care in this setting. [4]

Pancreatic ductal adenocarcinoma (PDAC) is the twelfth most common cancer in the world. [5] Its incidence has been consistently increasing for the last 25 to 30 years, [6, 7] with more than 14,000 new cases reported annually in France alone. [8] PDAC is even predicted to become the second leading cause of cancer-related deaths in the US by the year 2030, with similar trends observed in Europe, making it a public health problem. [9] Fifteen (15) to 20% of patients with pancreatic cancer are candidates for surgery, which when combined with adjuvant chemotherapy, is the only potential curative treatment. [10, 11]

The aim of this review is to examine the TNCD guidelines in the context of PDAC and discuss their practical implementation throughout Europe. Additionally, algorithms have been developed by the authors to demonstrate the possible sequential patient care pathways based on guideline recommendations in this clinical setting.

Malnutrition, Cachexia and Sarcopenia in Pancreatic Cancer

Health-related quality of life, overall survival and treatment-related complications are negatively impacted by malnutrition in cancer patients [4, 14] which is highly prevalent at diagnosis and affects more than 60% of patients with PDAC [12, 13]. Malnutrition in patients with pancreatic cancer is multifactorial, with reduced food intake, treatment, cancer progression, and lack of physical activity as contributing factors. Reduced food intake may be caused by diminished appetite, chemosensory

disturbances in taste and smell, early satiety, nausea due to reduced upper gastrointestinal motility, distal tract dysmotility, pain, and anxiety/depression. [15] Treatment side effects may include mucositis, constipation, or diarrhea, all of which can worsen malnutrition. [2, 4] The progression of a primary tumor or peritoneal carcinomatosis may cause gastrointestinal tract obstruction, [2, 4] while disease-mediated pancreatic exocrine insufficiency (PEI) may induce maldigestion (prevalent in >50% of patients with advanced PDAC). [16] Other contributing factors may include unbalanced glycemic control, whether it is pre-existing and worsened or paraneoplastic diabetes mellitus, and cancer-related hypercatabolism which increases resting energy expenditure. [15] Patients who are affected by PDAC, especially at advanced stages, suffer from reduced cardiorespiratory function and muscle strength [17], both of which are exacerbated with limited or impaired physical activity. [18, 19]

Cachexia and sarcopenia are two conditions related to malnutrition in cancer patients. Cancer related cachexia, defined as a loss of skeletal muscle mass (with or without loss of fat mass) due to inflammation (which can be assessed by C-reactive protein serum level and/or neutrophil-to-lymphocyte ratio), is a dynamic process leading to progressive functional impairment and is most often irreversible by conventional nutritional interventions at late stage. [15] Sarcopenia, the loss of skeletal muscle mass and function, has been described in older people, [20] but is also observed in cancer patients, and is often associated with a poor physical status. [14, 21-23]

In the perioperative setting, malnutrition, sarcopenia and poor physical fitness has been shown to impact postoperative outcomes including higher morbidity, increased overall complications, infections and hospital readmissions, longer length of hospital stays and higher costs. [24-26] Furthermore, malnutrition impacts the patients' oncological outcomes, particularly when postoperative complications either delay the start of or contraindicate the administration of adjuvant treatments. The impact of malnutrition, sarcopenia, and cachexia has also been described in the advanced PDAC setting, with studies associating a reduction in fat-free mass (related to reduction in muscle mass) and malnutrition with shorter survival. [14]

Malnutrition Diagnosis According to Guidelines

Given the impact of malnutrition on postoperative morbidity and mortality [27], early identification and treatment of patients who might be malnourished or at risk of malnutrition is important. [2, 28] Early nutritional evaluation and intervention have been associated with better prognoses in patients undergoing chemotherapy for locally advanced or metastatic PDAC. [29] In fact, nutrition support provided within 3 months from diagnosis has been shown to improve 2-year survival. [29]

Major global clinical nutrition societies developed the Global Leadership Initiative on Malnutrition (GLIM) criteria for diagnosing malnutrition in adults. [30] According to these criteria, malnutrition can be diagnosed through a two-step approach: (1) identifying malnourished patients using simple clinical criteria like food intake, the calculation of body weight loss, the calculation of body mass index (BMI), and measurement of muscle mass or function, and (2) grading the severity of malnutrition (including albuminemia dosage). [30] Current nutrition assessment tools are summarized in Table 1. [31-37] Measurement of muscle mass or function is particularly important in obese patients in whom weight loss and BMI can miss the diagnosis of malnutrition (so called sarcopenic obesity). [38]

Authors' Opinion

Our opinion is that there are three tools that can be used in the daily practice of oncology care to assess muscle mass and function: (i) CT-scan centered to the third lumbar vertebra (given that patients with cancer undergo regular CT-scans for tumor evaluation, even though the cut-offs for defining muscle mass reduction in cancer patients are not consensual), (ii) bioimpedance analysis, and (iii) handgrip strength measurement (the latter two being simple tools used at bedside or during outpatient visits).

Overall, in accordance with French Haute Autorité de Santé (guidelines published in 2019 and 2021 for the diagnosis of malnutrition in patients > 70 and ≥ 70 years old, respectively) [65, 66], we

consider the GLIM criteria of malnutrition diagnosis sufficient to identify all forms of malnutrition in daily practice, including cachexia and sarcopenia in PDAC patients.

Patient Treatment and Support According to Guidelines

Nutrition

In the perioperative setting of PDAC, the TNCD and ESPEN guidelines recommend preoperative immunonutrition i.e., nutrition therapy containing arginine, nucleotides, and omega-3 fatty acids. [39, 40]. The TNCD guidelines also recommend 7 to 14 days of preoperative nutritional intervention for malnourished patients. [41]

The International Study Group on Pancreatic Surgery (ISGPS) [42] and ESPEN recommend perioperative nutrition support, [41] with the type and duration depending on the patient's nutritional status and severity of malnutrition. [41] A limited duration of fasting before surgery (2 hours for liquids and 6 hours for solids) and early postoperative oral feeding (within 24 hours, in the absence of surgical contraindication) are recommended according to Enhanced Recovery After Surgery (ERAS) guidelines. [4]

The TNCD guidelines recommend that all patients undergo regular screening for malnutrition and patients' daily nutritional intake should range between 25 to 30 kcal/kg, including 1.0 to 1.5 g of protein/kg. [4] Nutritional interventions should be based on oral intake (evaluated with the Simple Evaluation of Food Intake [SEFI[®]]), [44, 45], inflammatory status and physical activity level of each patient. Oral nutritional supplements (ONS) have been associated with improved nutritional status, prolonged survival, and better quality of life [48, 49] and are recommended when food intake is reduced (SEFI[®] \leq 7/10), irrespective of patients' nutritional status. [2] When oral food intake, including ONS, is insufficient to cover the patient's nutritional needs, enteral tube feeding ([EN], if the gastrointestinal [GI] tract is functional and accessible) [2, 53] or supplemental/total parenteral nutrition (PN) to bypass the GI tract [54] (when EN is impossible e.g., digestive tract obstruction or insufficient) should be considered. In 506 hospitalized patients with all types of cancer (including 84

cases of digestive cancer), the randomized EFFORT trial demonstrated the benefit of systematic individualized nutritional intervention using a step-up approach (ONS, then addition of EN if insufficient, then addition of PN if insufficient), resulting in a 43% reduction in the risk of death at 30 days (HR 0.57, CI 95% 0.35-0.94, $p = 0.027$) and an improvement in the functional prognosis and quality of life scores. [46, 47]

It is essential to control symptoms interfering with food intake (e.g., pain, nausea, mucositis, mycosis). Corticosteroids (at the minimum effective dose in a short course) or olanzapine can be proposed to increase appetite (TNCD 2022, ESPEN 2021, American Society of Clinical Oncology [ASCO] 2020, European Society for Medical Oncology [ESMO] 2021). The TNCD guidelines recommend pancreatic enzyme supplementation (\pm proton pump inhibitor to improve efficiency) if symptoms of PEI (e.g., diarrhea with fatty stools, abdominal discomfort, or low fecal elastase level) are noted. [50] Additionally, glycemic monitoring and treatment of diabetes is recommended. [4, 51] Therapeutic fasting and restrictive diets (e.g., sugar exclusion, ketogenic diet) have not demonstrated clinical benefit and can have a deleterious effect on the nutritional status of patients. These diets are, therefore, not recommended. [52]

In the induction setting for locally advanced pancreatic cancer, radiotherapy on its own or combined with chemotherapy may be considered (mostly in clinical trials). In this advanced disease setting, the TNCD guidelines recommend nutritional interventions including personalized dietary counselling and ONS, when necessary. If oral intake is insufficient, EN through a nasogastric tube is recommended however, PN is not. [4]

The TNCD, ESPEN and SEOM guidelines present similar recommendations for digestive cancer in the end-of-life setting. [2, 54] Based on existing literature, the initiation of artificial nutrition is not recommended if a patient's life expectancy is less than three months and if the permanent functional impairment is severe (Eastern Cooperative Oncology Group Performance Status [ECOG-PS] ≥ 3 or Karnofsky Index $\leq 50\%$), due to an unfavorable risk-benefit balance in this context. [4, 55, 56]

Physical Activity

Appropriate physical activity in patients undergoing chemotherapy can be beneficial for managing cancer-related fatigue, minimizing decline in cardiorespiratory fitness, limiting muscle strength reduction, and reducing treatment-related side effects. [4, 57, 58] Therefore, supportive care for patients with cancer should include adapted physical activity. [4]

The TNCD guidelines recommend advanced digestive cancer patients to be educated on the benefits of physical activity and for sedentary behavior to be limited in order to encourage the progressive implementation of feasible physical activity with the support and guidance of professional physiotherapists or adapted physical activity trainers. [4] The ESPEN and SEOM guidelines similarly recommend maintaining physical activity in patients undergoing chemotherapy, [2, 54] whereas ESMO guidelines for physical activity are still under preparation. The TNCD guidelines also emphasize the benefits of adequate levels of physical activity for patients undergoing combined chemotherapy and radiotherapy. [4]

Physical exercises should be adapted in the early postoperative period. [4] Two randomized controlled studies show a benefit to aerobic capacity [59, 60] and a 51% decrease in the risk of postoperative complications [59] when multimodal pre-habilitation programs including nutrition, diabetes/blood pressure balance, smoking/alcohol cessation, psychological/stress management, structured aerobic and muscle strengthening exercises were implemented for abdominal surgery. [61, 62] The Adapted Physical Activity in advanced Pancreatic Cancer patients randomized trial (APACaP), [63] presented at ASCO 2022, evaluated the contribution of advanced physical activity in more than 300 patients receiving first-line chemotherapy for advanced pancreatic cancer [64]. It consisted of a 16-week homebased aerobic and muscle-strengthening exercise program, complementing activities of daily living, with a weekly supervised session conducted via videoconference by an APA instructor, and unsupervised sessions with a designated companion in the patient's environment at least once a week. The primary objective of the study (improvement at week 16 of fatigue, physical functioning, overall quality of life) was not statistically achieved, but secondary analyses showed a benefit on several other scores of the European Organisation for Research and Treatment of Cancer (EORTC) quality of life questionnaire QLQ-C30, such as functioning scales, pain, insomnia, loss of appetite, and

constipation, with no deterioration in any score or adverse effect. In addition, a trend in favor of APA was also observed for overall survival, progression-free survival, and tumor response rate.

Sequential Patient Care Pathways for Pancreatic Cancer in Clinical Practice

The lack of routine screening procedures during diagnosis means that a significant number of patients at nutritional risk remain undetected, and therefore, the opportunity for early intervention, which would be more effective, is lost. [65] Therefore, a standardized protocol for a patient-centered clinical pathway with multidisciplinary and integrated organization would be ideal to accelerate and improve the management of PDAC patients. If efficient, this would allow the concentration of resources within a short time frame.

Irrespective of the disease state, a nutritional assessment should be systematically included in the patient's file and discussed during a multidisciplinary oncology meeting. Following this meeting, a nurse and dietitian can coordinate the implementation of nutritional therapy and plan for reassessment at each stage of the treatment strategy. Ideally, this evaluation is integrated systematically in the care pathway, with patient referral for nutritional consultation. [67]

Treatment for operable adenocarcinoma of the pancreas (resectable or borderline)

The ideal setting for the initial evaluation of patients eligible for neoadjuvant chemotherapy would be in the hospital, but follow-up evaluations could be carried out by independent dietitians (care provider or hospitalization at home) in coordination with the oncology team. A preoperative evaluation or reassessment is mandatory for patients who are immediately eligible for curative surgery or after neoadjuvant chemotherapy as the nutritional status may quickly deteriorate (Figure 1).

During hospitalization, nutritional support should be offered immediately postoperatively by the dietitian team (especially after a pancreaticoduodenectomy), with artificial nutrition for malnourished patients favoring EN or mixed EN and PN, taking into consideration the surgeon's instructions. [41]

Prior to hospital discharge or to the postoperative follow-up consultation (usually at 1 month in the absence of postoperative complications), nutritional status should be reassessed systematically to evaluate the need for continued nutrition support, particularly since adjuvant chemotherapy will be administered. This postoperative follow-up should be coordinated with the care provider or hospitalization at home. PN should be considered as part of exclusive support care if the patient is likely to survive long enough to benefit from the treatment. [42] Apart from nutritional intervention, adapted physical activity (including early mobilization) should be encouraged with regular aerobic and resistance exercises.

Treatment for locally advanced cancer and metastatic adenocarcinoma of the pancreas

The nutritional status of patients with locally advanced or metastatic disease (Figure 2 and Figure 3) should be evaluated prior the start of chemotherapy. In fact, the patient's nutritional, and performance status (ECOG-PS) will influence the clinician's decision of chemotherapy regimen and doses, as polychemotherapy (e.g., FOLFIRINOX, Gemcitabine + nab-paclitaxel) can be poorly tolerated in patients with malnutrition. Dietetic counselling should be offered to all patients and depending on the presence and severity of malnutrition, ONS, EN and/or PN may be required. Apart from nutritional intervention, adapted physical activity should be encouraged, with regular aerobic and resistance exercises.

Nutritional status and side effects should be carefully monitored after the first cycle of chemotherapy (particularly during combination chemotherapy), as worsening of malnutrition can be observed.

Weight and food intake (SEFI[®]) should be measured at each patient visit, with intervention readjustments, as necessary. Good communication and interactions between hospital and patient's home care providers remains essential to ensure optimal management. PN should be considered as part of exclusive support care in advanced cancer patients with malnutrition who are expected to survive for more than 1 to 3 months. [42]

As a result of the poor prognosis of metastatic disease and the frequency of problematic symptoms, priority is given to immediate supportive care. Healthcare providers should explain to the patients and their families why artificial nutrition is not recommended.

Main Challenges in Integrating Nutritional Support in

Oncological Treatment

Sufficient consideration of the patient's nutritional status is often lacking in the clinical setting for pancreatic or digestive cancer, which may be attributed to oncologists' limited awareness of its impact on patients with cancer and the lack of regular nutritional assessments. [23] Thus, homogenizing nutritional assessment in trials and clinical practice and utilizing universally applicable nutritional assessment tools is instrumental. Multidisciplinary meetings should be organized to develop a global point of view regarding the integration of nutritional assessments and nutritional support, in parallel to oncologic treatments. Moreover, training to enhance the awareness of oncologists and other healthcare providers will be important in implementing the optimal nutritional and physical activity interventions. [69]

Nasogastric feeding tubes are an essential component of EN and their acceptance by the care team and the patients plays a key part in EN's success. Therapeutic patient education is likely to be an effective means for the appropriate integration of nutritional interventions in oncological treatment.

In the perioperative setting, oncologists often come across complex situations where they need to manage priority and scheduling issues with respect to early cancer resection and nutritional support. Furthermore, logistical, and organizational limitations, like the lack of timely referrals and availability of hospital beds, pose critical challenges when providing nutritional support with oncologic treatment. These issues can be addressed by integrating systematic screening using simple tools at diagnosis, during hospitalization and at regular reassessments. Also, systematic, and rapid dietician consultations are key to personalize a nutritional program that can be pursued at home. If possible, a coordination nurse should be assigned to effectively manage all logistical issues. [4] In addition, the development

of neoadjuvant chemotherapy offers a time window of opportunity to implement pre-habilitation programs [59-62].

Delays in the initiation of artificial nutrition can worsen malnutrition and electrolyte/vitamin/trace element deficiencies and can increase the risk of refeeding syndrome. These consequences are potentially life-threatening and require longer hospital stays for cautious refeeding. Patients receiving artificial nutrition, especially home EN or PN, should be monitored regularly in order to prevent any related adverse effects. [70, 71] Monitoring protocols need to be developed by oncologists in collaboration with clinical nutritionists. [71]

It is important to note that there are certain negative aspects and potential detrimental effects associated with undue nutritional interventions. Evidence shows that nutrition interventions can lead to adverse events like diarrhea, vomiting, or discontinuation of ONS due to low palatability. [72]

Although ONS is recommended as a supplement to normal food intake (not as a meal replacement), it has been associated with a decrease in normal food intake. [73] Patients should be reminded that ONS should be taken distant from meals to prevent compromising normal food intake. In case of EN, general side-effects include vomiting, regurgitation, constipation, diarrhea, abdominal distention, and tube obstruction. [74] Potential complications associated with PN can include line-associated infections, vascular thrombosis, cholestatic and steatosis liver disease, cholelithiasis, electrolyte imbalances and fluid overload. [75, 76] Frequent monitoring and adjustment of nutritional needs of patients on ONS, EN and PN helps avoid these potential negative effects.

Artificial nutrition can lead to metabolic disorders such as hyperglycemia, hypoglycemia, or refeeding syndrome in severely malnourished patients (with the risk of fatal cardiac and neurologic symptoms due to fluid and electrolytes shifts). [75, 77]

The lack of a multimodal approach, including novel therapeutic agents, also impedes effective management of nutritional issues. [78] For all patients, oncologists should consider three supportive care issues: ensuring sufficient energy and protein intake, promoting physical activity to maintain muscle mass, and reducing systemic inflammation, when present, although no specific drug is

approved for routine practice. The results of phase II/III trials based on novel drug targets (e.g., cytokines, ghrelin receptor, androgen receptor, myostatin) targeting systemic inflammation or signaling pathways involved in muscle wasting are expected in the next two years. If such effective therapies emerge, early detection of malnutrition will be increasingly important for timely intervention which can improve both patient-centered and oncological outcomes. [79]

Finally, the lack of prospective controlled evidence-based trials is a major challenge. [80] There is an urgent need for well-designed clinical trials combining adequate nutrition evaluation tools together with nutritional and adapted physical activity interventions to evaluate their real impact on chemotherapy dose-intensity and oncological outcomes, such as progression-free survival and overall survival.

Conclusions

Malnutrition is an ongoing challenge that patients with PDAC face at all stages of the disease. Although the ESPEN guidelines form a framework for implementing nutritional interventions in patients with cancer, there is a lack of guidance for specific cancer types. Considering this, the French TNCD practice guidelines were presented here to provide functional guidance on integrating nutritional interventions and physical activity into treatment plans for patients with digestive cancers. These practice guidelines are aligned with multiple guidance such as ISGPS, ESPEN and SEOM, which will allow their expanded application to other European countries outside of France. The TNCD guidelines help provide the best supportive care to patients with PDAC and are based on the premise that when malnutrition is diagnosed early, appropriate nutrition support can be initiated and monitored, which will improve the patient's clinical outcome.

Despite certain challenges, such as lack of awareness and training of oncological team on the role of nutritional assessment and support, the impact of poor nutritional status, logistical and organizational issues, and lack of prospective controlled evidence-based trials, this review highlights the impact of poor nutritional status and the importance of nutritional awareness and support on the overall survival and quality of life of digestive cancer patients.

Acknowledgements

The authors thank Annyesha Satapathy, PhD of Medicalwriters.com, Zurich, Switzerland and Denise Saliba, of Baxter Malta for providing medical writing support, which was funded by Baxter International Inc., Deerfield, IL, USA in accordance with Good Publication Practice (GPP3) guidelines (<http://www.ismpp.org/gpp3>).

Authors' disclosure

J. Taieb has received honoraria as a speaker or in an advisory role from Sanofi, Baxter, Merck Serono, Amgen, Servier, Pierre Fabre, BMS, AstraZeneca, Astellas and MSD.

C. Neuzillet has received honoraria / consulting from Amgen, AstraZeneca, Baxter, Bristol-Myers Squibb, Fresenius Kabi, Incyte Biosciences, Merck, MSD, Mundipharma, Mylan, Novartis, Nutricia, OSE Immunotherapeutics, Pierre Fabre, Roche, Sanofi, Servier, Viatris. Research funding/clinical trials from AstraZeneca, Bristol-Myers Squibb, Fresenius Kabi, Nutricia, OSE Immunotherapeutics, Roche, Servier, Viatris.

R. Thibault has acted in a consulting capacity and attended conferences for Aguetant, Baxter, BBraun, Fresenius-Kabi, Nutricia, and Servier; had conferences fees paid for by Homeperf, Lactalis, and Nestlé; was awarded research subvention by Elivie; and has royalties related to the conception of the Simple Evaluation of Food Intake (SEFI[®]).

All other authors declare no conflicts of interest.

Funding

The authors received no financial support for the research, authorship, and/or publication of this article. Annyesha Satapathy, PhD of Medicalwriters.com, Zurich, Switzerland was funded by Baxter International Inc., Deerfield, IL, USA to provide medical writing support.

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Tables

Table 1. A summary of currently used nutritional assessment tools.

Nutrition assessment tools	Description	Advantages	Limitations
The GLIM criteria [30]	<p>A two-step approach for malnutrition diagnosis:</p> <ul style="list-style-type: none"> - screening to identify “at risk” status by the use of any validated screening tool; - diagnosing and grading the severity of malnutrition. <p>Developed to promote global use that may be combined with other approaches and additional criteria of regional preference.</p>	<ul style="list-style-type: none"> • Intended to be simple and easily used by clinicians and other healthcare practitioners. • Only modest training should be required. • The proposed approach includes risk screening and diagnosis. 	<ul style="list-style-type: none"> • Lacks the robust details of comprehensive nutrition assessment. • The inclusion of cachexia and sarcopenia with other disease-related malnutrition conditions may diminish appreciation for some of their distinctive features. • Intended to be used in parallel with established concepts and nomenclature.
Simple evaluation of Food Intake (SEFI®) [31]	<p>Two methods in one tool to evaluate food intake:</p> <p>A simple visual analogue or numerical scale and an assessment of consumed food portions; [82] correlates well with the diagnosis of malnutrition in the hospital setting. [31] (hospitalised and outpatient oncology clinic patients) [43, 83] in the primary care setting, [31] and in nursing homes. [82]</p>	<ul style="list-style-type: none"> • Simple and easy to use. • Faster compared to other tools. • Specificity is higher than sensitivity and thus may have a better predictive performance. 	<ul style="list-style-type: none"> • Patients with cognitive disorders might not be able to respond accurately to the analogue visual scale (in this situation the assessment of consumed food portions by the healthcare professionals could be used). • Limited sensitivity that may miss some patients
Malnutrition Universal Screening Tool (MUST)	<p>Validated in cancer patients in hospital inpatient, outpatient and community settings; [32,</p>	<ul style="list-style-type: none"> • A simple validated tool and can be used by any adequately educated health professional. 	<ul style="list-style-type: none"> • Healthcare professionals often feel overwhelmed with the multiplicity of procedures (even though it is simple to

	33, 81] most commonly used tool in hospitals and care homes.	<ul style="list-style-type: none"> • Fast and incorporates objective and subjective/clinical parameters reflecting changes in nutritional risk and status. • Validated in a study as the best screening scale for malnutrition versus Nutritional Risk Screening-2002 (NRS-2002) according to the reference definition of malnutrition by ESPEN at the time of the study. [34] 	use).
Mini Nutritional Assessment – Short Form (MNA-SF)	A nutrition screening tool for geriatric patients; assesses nutrition risk to determine appropriate interventions. [32, 81]	<ul style="list-style-type: none"> • Easily accessible due to smartphone app and web-based forms. 	<ul style="list-style-type: none"> • Only for geriatric patients. • Focuses on nutrition risk. • Low specificity compared to other methods.
Subjective Global Assessment (SGA)	SGA is a valid and reliable tool used for all types of patients and it assesses the patient’s medical history (weight loss, dietary intake, gastrointestinal symptoms and functional capacity) and physical characteristics (subcutaneous fat, muscle wasting and oedema). [32, 81]	<ul style="list-style-type: none"> • Good predictive validity of length of hospital stay, mortality and complications 	<ul style="list-style-type: none"> • More useful for identifying established malnutrition than nutritional risk. [35] • Suboptimal sensitivity. [35]
PG-SGA	PG-SGA is a patient-reported version of the SGA, based on a combination of known prognostic indicators of weight loss, performance status, clinical aspects of	<ul style="list-style-type: none"> • Only validated and specific tool for nutritional assessment in oncology. 	<ul style="list-style-type: none"> • Requires ideally a trained nutrition professional. • Time-consuming and thus not easy in daily practice. • Involves patients that need to be able to understand the questionnaire

	dietary intake and its impediments. [32, 81]		
Nutritional Risk Index (NRI)	One of the oldest tools used to identify GI surgery adult patients at risk for postoperative complications according to their nutritional risk based on weight loss and plasma albumin. [32, 36]	<ul style="list-style-type: none"> • Assists in the identification of individuals who are at risk nutritionally, but who would not otherwise receive a complete diagnostic work-up. 	<ul style="list-style-type: none"> • Not well correlated with oncological outcomes in some recent publications. [84]
The Nutritional Risk Screening (NRS-2002)	Uses measures of current malnutrition and disease severity to screen patients at risk for poor nutritional status; it has been validated in hospitalized patients. [32, 37, 81]	<ul style="list-style-type: none"> • Nurses and doctors can use the tool after a short introduction. • Recommended by ESPEN as the first step of the GLIM procedure for malnutrition diagnosis 	<ul style="list-style-type: none"> • Complex to use and time-consuming.

Others: Malnutrition Screening Tool (MST), Glasgow Prognostic Score (GPS)

Treatment for operable adenocarcinoma of the pancreas (resectable or borderline)
3,400 patients (15-20%)

▶ Nutritional intervention
⚠ Artificial Nutrition

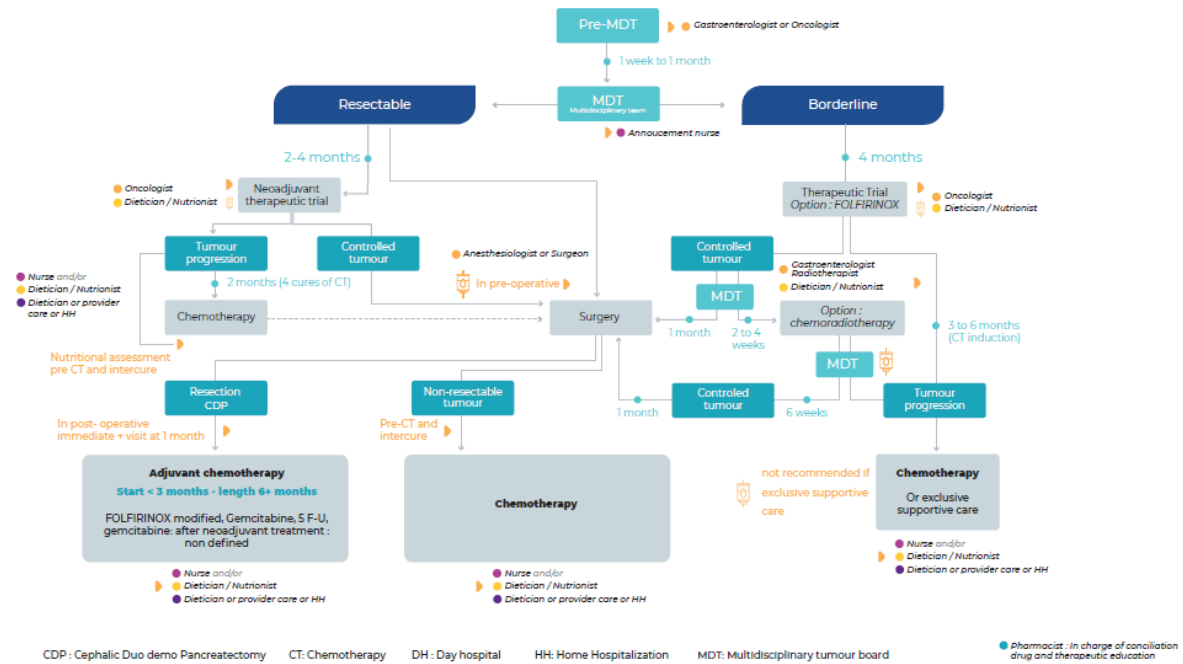


Figure 1. Treatment for operable adenocarcinoma of the pancreas (resectable or borderline) 3,400 patients (15-20%)

Treatment for locally advanced cancer of the pancreas
5100 patients (30%)

▶ Nutritional intervention
⚠ Artificial Nutrition

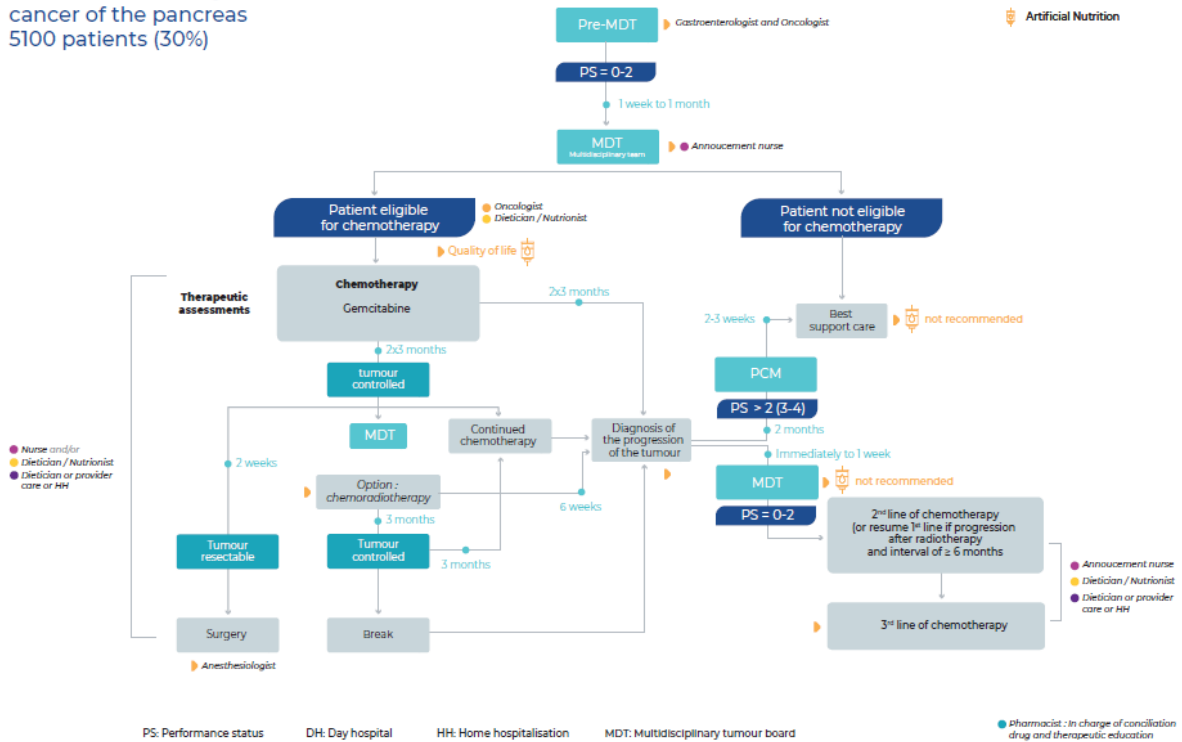


Figure 2. Treatment for locally advanced cancer of the pancreas 5100 patients (30%)

Treatment for metastatic adenocarcinoma of the pancreas ≥ 8500 patients (50%)

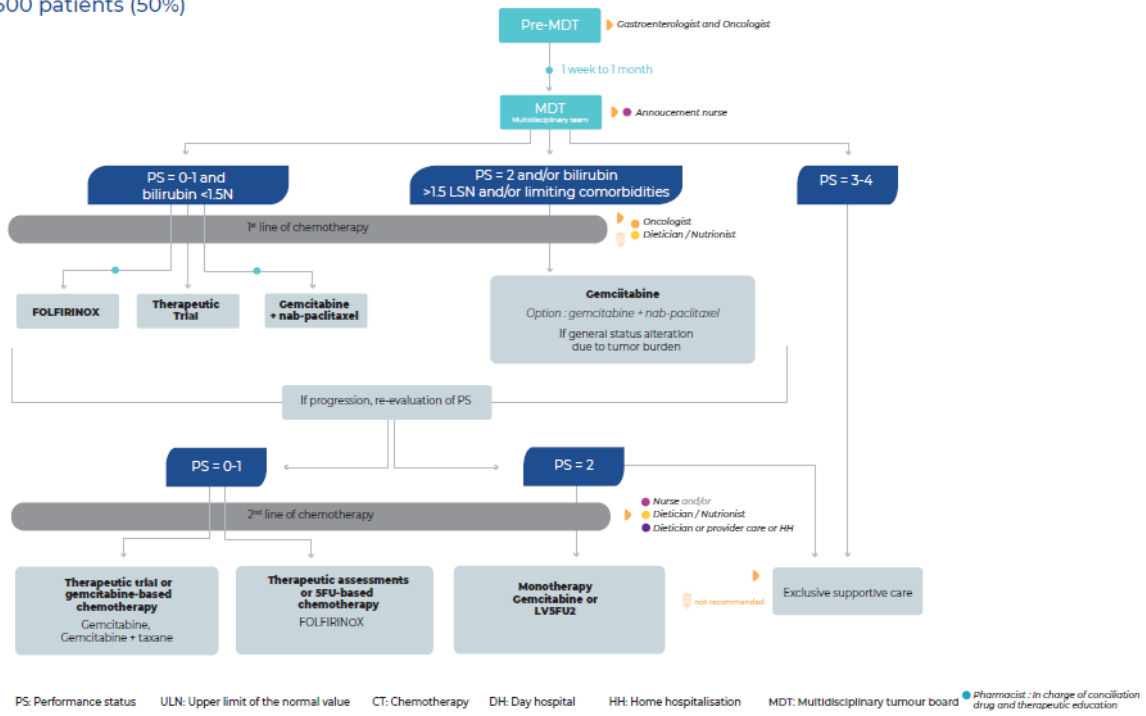


Figure 3. Treatment for metastatic adenocarcinoma of the pancreas ≥ 8500 patients (50%)

Conflict of interest

R. Thibault has acted in a consulting capacity and attended conferences for Aguetant, Baxter, BBraun, Fresenius-Kabi, Nutricia, and Servier; had conferences fees paid for by Homeperf, Lactalis, and Nestlé; was awarded research subvention by Elivie; and has royalties related to the conception of the Simple Evaluation of Food Intake (SEFI®). All other authors declare no conflicts of interest.

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