European Journal of Surgical Oncology 50 (2024) 106953

Contents lists available at ScienceDirect

European Journal of Surgical Oncology

journal homepage: www.ejso.com

Current practice in assessment and management of malnutrition in surgical oncology practice – An ESSO-EYSAC snapshot analysis

Andreas Brandl [a, *], Dara Lundon [b], Laura Lorenzon [c], Yvonne Schrage [d], Carmela Caballero [e], Carl Jacob Holmberg [f], Nada Santrac [g], Henry Smith [h], Mariela Vasileva-Slaveva [i], Giacomo Montagna [j], Eduard-Alexandru Bonci [k, y], Olivia Sgarbura [l], Raza Sayyed [m], Almog Ben-Yaacov [n], Johnn Henry Herrera Kok [o], Ina Suppan [p], Pallvi Kaul [q], Dana Sochorova [r], Nikolaos Vassos [s], Marta Carrico [t], Helen Mohan [u], Wim Ceelen [v], Jann Arends [w], Sergio Sandrucci [x]

[a] Department of General, Visceral and Transplantation Surgery, University Hospital Heidelberg, Germany
[b] Mount Sinai Department of Urology, New York, United States
[c] Fondazione Policlinico Universitario Agostino Gemelli IRCCS, Rome, Italy
[d] Department of Surgical Oncology, Netherlands Cancer Institute, Amsterdam, the Netherlands
[e] Breast International Group, Brussels, Belgium
[f] Department of Surgery, Institute of Clinical Sciences, Sahlgrenska Academy, Gothenburg University, Sweden
[g] Surgical Oncology Clinic, Institute for Oncology and Radiology of Serbia, Belgrade, Serbia
[h] Digestive Disease Center, Bispebjerg and Frederiksberg Hospitals, University of Copenhagen, Denmark
[i] Medical University Pleven, Pleven, Bulgaria
[j] Breast Surgery Service, Memorial Sloan Kettering Cancer Center, New York, NY, USA
[k] Surgical Oncology and Gynecologic Oncology Department, "Iuliu Hatieganu" University of Medicine and Pharmacy, Cluj-Napoca, Romania
[l] Department of Surgical Oncology, Institut du Cancer Montpellier, University of Montpellier, France
[m] Department of Surgical Oncology, Patel Hospital, Karachi, Pakistan
[n] Department of General and Oncological Surgery - Surgery C, Sheba Medical Center, Tel-Hashomer, Israel
[o] Upper GI Unit, University Hospital of Léon, Spain
[p] Breast Center, Department of Gynaecology, Rottal-Inn-Kliniken Eggenfelden, Germany
[q] Department of Surgical Oncology, Shri Guru Ram Rai Institute of Medical and Health Sciences, Dehradun, India
[r] Department of Surgery, University Hospital Brno, Faculty of Medicine, Masaryk University, Brno, Czech Republic
[s] Division of Surgical Oncology and Thoracic Surgery, Department of Surgery, University Medical Center Mannheim, University of Heidelberg, Mannheim, Germany
[t] Nutrition Department - Champalimaud Foundation, Champalimaud Centre for the Unknown, Lisbon, Portugal
[u] Peter MacCallum Cancer Centre in Melbourne, Australia
[v] Department of GI Surgery and Cancer Research Institute Ghent (CRIG), Ghent University Hospital, Belgium
[w] Department of Medicine I, Medical Center - University of Freiburg, Faculty of Medicine, University of Freiburg, Germany
[x] University of Turin, Torino, Italy
[y] Breast Unit, Champalimaud Clinical Centre, Champalimaud Foundation, Lisbon, Portugal

ARTICLE INFO

Article history:
Received 2 May 2023
Received in revised form
1 June 2023
Accepted 6 June 2023
Available online 26 June 2023

Keywords:
Malnutrition
Screening
Cancer

ABSTRACT

Introduction: Malnutrition is common in patients suffering from malignant diseases and has a major impact on patient outcomes. Prevention and early detection are crucial for effective treatment. This study aimed to investigate current international practice in the assessment and management of malnutrition in surgical oncology departments.

Material and methods: The survey was designed by European Society of Surgical Oncology (ESSO) and ESSO Young Surgeons and Alumni Club (EYSAC) Research Academy as an online questionnaire with 41 questions addressing three main areas: participant demographics, malnutrition assessment, and peri-operative nutritional standards. The survey was distributed from October to November 2021 via emails, social media and the ESSO website to surgical networks focussing on surgical oncologists. Results were collected and analysed by an independent team.

* Corresponding author. University Hospital Heidelberg, Germany.
E-mail address: Andreas.Brandl@med.uni.heidelberg.de (A. Brandl).

https://doi.org/10.1016/j.ejso.2023.06.005

Surgical oncology
Pre-habilitation

Results: A total of 156 participants from 39 different countries answered the survey, reflecting a response rate of 1.4%. Surgeons reported treating a mean of 22.4 patients per month. 38% of all patients treated in surgical oncology departments were routinely screened for malnutrition. 52% of patients were perceived as being at risk for malnutrition. The most used screening tool was the "Malnutrition Universal Screening Tool" (MUST). 68% of participants agreed that the surgeon is responsible for assessing preoperative nutritional status. 49% of patients were routinely seen by dieticians. In cases of severe malnutrition, 56% considered postponing the operation.
Conclusions: The reported rate of malnutrition screening by surgical oncologists is lower than expected (38%). This indicates a need for improved awareness of malnutrition in surgical oncology, and nutritional screening.

1. Background

Cancer is a leading cause of death worldwide and its incidence and mortality is rapidly growing. The number of new cancer cases in Europe is predicted to increase from 2.8 million in 2020 to 3.4 million in 2040, with cancer deaths increasing from 1.3 million in 2020 to 1.7 million by 2040 [1,2]. This increase is supported by the prevalence and distribution of main risk factors for cancer, which are mainly associated with socioeconomic development, as well as both aging and growth of the population [3]. Politicians worldwide recognized the importance of this development and proclaimed amongst others the European Beating Cancer Plan in February 2021 [4].

Cancer patients often suffer from malnutrition, a condition characterized by unintentional weight loss due to a lack of intake or uptake of nutrients, which is the consequence of both the effect of the tumour on the body, and surgical and medical anticancer therapies [5]. Inadequate food intake, decreased physical activity, and catabolic metabolic derangement are often observed in these patients. Malnutrition not only affects the quality of life, as it is often associated with lethargy, but also the ability to receive anticancer therapy and to withstand any associated toxicities. According to estimations, malnutrition contributes to a significant proportion of cancer patients' death (10–20%) [6].

Malnutrition could lead to sarcopenia, which is defined as "a progressive and generalised skeletal muscle disorder that is associated with increased likelihood of adverse outcomes including falls, fractures, physical disability and mortality" [7]. There is evidence of increased postoperative morbidity and mortality, prolonged hospital stay, decreased quality of life and faster tumour progression in cancer patients suffering from sarcopenia and malnutrition across different tumour entities [8–10]. Nutrition is a pillar of modern prehabilitation programs, which are being investigated in several different cancers [11].

Practical guidelines such as the European Society for Clinical Nutrition and Metabolism.

(ESPEN) help navigate nutritional assessment and treatment/support in cancer patients [12].

Despite a common need for nutrition and its interventions in cancer patients, the implementation of nutritional strategies varies between most European countries. Resources and funding for dedicated nutritional services are lacking, and in some countries, such as Poland, nutritionists, and dietitian experts are not even recognized as health care professionals [11]. A previously conducted study showed that nutritional assessment is largely neglected [13]. Further development is required, not only in terms of improving the infrastructure of hospitals, but also in standardising the approach to nutritional assessments and therapy, in order to provide cancer patients with this urgently needed support across the board.

The aim of this study was to capture real-world data about the assessment and treatment strategies for malnutrition among cancer patients by using a global online survey amongst specialised cancer surgeons.

2. Material and Methods

2.1. Questionnaire development

The focus of the questionnaire was to document the current international practice in screening for cancer related malnutrition in an international snapshot survey. The development of the questionnaire involved several steps to ensure its validity and reliability. First, a comprehensive literature review was conducted to identify the key factors related to nutrition in surgical oncology patients. Based on this, a preliminary pool of items was generated. A working group of surgical oncologists across the world reviewed the items and provided feedback on their relevance and the clarity of the questions. A pilot study was then conducted with a smaller group of surgical oncologists from within the European Society of Surgical Oncology (ESSO) Young Surgeons and Alumni Club (EYSAC) to assess the comprehensibility and feasibility of the questionnaire. Final validation was performed by senior experts in surgical oncology and/or nutrition (S.S., W.C., J.A.)

The final questionnaire was composed of 41 questions, which assessed the following domains:

1. respondents' demographics
2. nutritional status - screening and assessments utilized
3. nutritional therapy, dietary counselling, and communication
4. details on preoperative, perioperative and postoperative cancer practice regarding nutritional status, monitoring, and treatment
5. two clinical scenarios were offered to determine patterns of respondent's routine clinical practice

See appendix for full questionnaire (Appendix_Fig. 1). Finally, the refined study instrument was deployed using REDCap (Research Electronic Data Capture).

2.2. Survey distribution and data collection

The questionnaire was designed, distributed, and study data was collected and managed using REDCap electronic data capture tools hosted by ESSO-EYSAC. REDCap is a secure, web-based software platform designed to support data capture for research studies, providing 1) an interface for validated data capture; 2) audit trails for tracking data manipulation and export procedures; 3) automated export procedures for data downloads to common statistical

packages; and 4) procedures for data integration and interoperability with external sources [14,15]. Data collection took place over a period of eight weeks in October and November 2021. The survey was distributed using the international network of ESSO-EYSAC, including the EYSAC Steering Committee and National Representatives and Partner societies.

The primary social media accounts promoting the survey (@essonews and @eysac1 – on Twitter) generated 929 number of impressions during the survey period, impressions beeing one of the key metrics used to evaluate the reach and engagement of tweets. On Twitter, an impression is defined as the number of times a tweet is displayed to users; including both times when the tweet is directly shown to a user on their timeline, as well as instances where the tweet appears as part of a larger conversation, having been retweeted, forwarded, or found in a search result.

2.3. Statistical analysis

Data were analysed with R Statistical Software [16]. Descriptive statistics (frequency, percentage, mean and standard deviation) were calculated and charted in data tables. Continuous variables were analysed using mean and standard deviations (SD), and compared using t-tests, whereas categorical variables were analysed using the Kruskal-Wallis test with a computation of the p-value based on the true distribution of K (to test if k samples come from the same populations with identical properties). A p-value of <0.050 was considered statistically significant. Missing data from participants were excluded from analysis. Subgroup analyses were performed based on geography (Europe versus the Rest of the World (ROW)), core specialties of the respondents (colorectal, gastro-intestinal (GI), general surgery and hepato-pancreato-biliary (HPB) surgery compared to all other respondents).

3. Results

There were 201 survey responses; however, 38 were excluded from the final analysis due to incomplete data. Final working dataset was composed of 163 responses: 89 (~55%) from Europe, 74 (45%) from ROW. The questionnaire was disseminated to 25 national partner societies, via social media platforms and to the ESSO mailing list of 14.228 recipients; the response rate was 1.4%. The survey was posted on the ESSO website on October 28, 2021.

3.1. Demographics

Demographic data for the respondents is illustrated in Table 1.

Table 1
Demographic description of study participants.

	[ALL] N = 163	[ALL] % (100%)
What is your gender?		
Female	44	27.0%
Male	119	73.0%
What is your age?		
<30	16	9.88%
30-35	40	24.7%
36-40	57	35.2%
41-50	30	18.5%
51-65	17	10.5%
>65	2	1.23%
What is your profession?		
Dietician/Nutritionist	3	1.92%
Doctor	151	96.8%
Nurse	1	0.64%
Other	1	0.64%
In which type of institution are you working?		
Community Hospital	17	10.4%
Private Practice	3	1.84%
Research Hospital	15	9.20%
University/Teaching Hospital	128	78.5%
What is your core specialty?		
General Surgeon	73	44.8%
Upper GI	21	12.9%
Colorectal Surgeon	20	12.3%
Gynaecology	7	4.3%
Peritoneal Surface Malignancy	7	4.3%
Breast	5	3.1%
HPB	4	2.5%
Thoracic	4	2.5%
Urology	4	2.5%
Melanoma	2	1.2%
Sarcoma	2	1.2%
Other	14	8.6%
Geographic Region		
Europe	89	54.9%
ROW	73	45.1%

3.2. Nutritional status: screening and assessments utilized

The routine assessment of oncology patients for risk of malnutrition was reported by 36.8% of respondents; and the rate of screening of this population by colorectal, GI, general and HPB surgeons (37.4%) was no different compared to other surgical specialties (35.1%; $p = 0.815$). (Table 2). The average number of patients treated per month by respondents was 22.6.

When screening was performed, MUST (Malnutrition Universal Screening Tool) [17] was the screening instrument most often used (21% of respondents), either used alone or in conjunction with other screening instruments (Fig. 1).

Those who reported malnutrition screening at their institution estimated that 52.4% of patients have or are at risk of having malnutrition. When no malnutrition screening is performed respondents estimated that 55.1% of oncology patients have malnutrition or are at risk of malnutrition.

Respondents estimated the proportion of oncology patients under their care that undergo estimation of muscle mass by using anthropometry to be 21.8%, by CT 18.5%, by bio-impedance analysis 14.5% and by DEXA (dual-energy X-ray absorptiometry) 10.4%.

3.3. Nutritional therapy, dietary counselling, and communication

Respondents estimated that 48% of patients are seen by a dietician. with no reported difference between respondents from Europe (46%) versus ROW (50.8%, $p = 0.478$), or by specialty (colorectal, GI, general surgery and HPB = 50.3, versus all other specialties = 41.5, $p = 0.249$)).

Respondents estimated that 38.1% of medical reports/discharge letters for oncology patients under their care contained information on nutritional status and treatment. For patients deemed 'at-risk' following malnutrition screening, 41.2% of respondents estimated that medical reports/discharge letters contain information on nutritional status and nutrition treatment at their institution.

3.4. Details on preoperative, perioperative and postoperative cancer practice regarding nutritional status, monitoring and treatment

79 of 115 (69%) respondents reported that surgeons are responsible for assessing preoperative nutritional status, with monitoring of nutritional status of the patients being done preoperatively, postoperatively, and after discharge in 47%, 62%, and 40% of cases, respectively. Most respondents start enteral nutrition on postoperative day one (POD1) (43 of 113, 38%).

The most commonly reported duration of preoprerative fluid

Table 2
Regional comparison of responses - Europe compared to the Rest of World (ROW). * 162 respondents provided a value to the question: "In which country are you practicing?"

	[ALL]	Europe	ROW	P-value
How long preoperatively do you not allow the patient to drink fluids?				0.038
2 h	30 (26.1%)	23 (34.8%)	7 (14.3%)	
6 h	36 (31.3%)	21 (31.8%)	15 (30.6%)	
8 h	16 (13.9%)	9 (13.6%)	7 (14.3%)	
12 h	11 (9.57%)	6 (9.09%)	5 (10.2%)	
Midnight	20 (17.4%)	6 (9.09%)	14 (28.6%)	
Other	2 (1.74%)	1 (1.52%)	1 (2.04%)	
How long preoperatively do you not allow patients to eat solid food?				0.157
6 h	26 (22.6%)	17 (25.8%)	9 (18.4%)	
8 h	22 (19.1%)	10 (15.2%)	12 (24.5%)	
12 h	33 (28.7%)	23 (34.8%)	10 (20.4%)	
Midnight	28 (24.3%)	12 (18.2%)	16 (32.7%)	
Others	6 (5.22%)	4 (6.06%)	2 (4.08%)	
Percentage of oncology patients monitored for nutritional status preoperatively	47.8 (34.6)	44.2 (33.3)	52.7 (36.1)	0.195
How often is surgery postponed if severe malnutrition is diagnosed before surgery?	55.4 (31.5)	45.3 (29.7)	69.1 (28.7)	<0.001
Is the patient's food intake monitored during hospitalization?				0.632
No	18 (15.8%)	9 (13.6%)	9 (18.8%)	
Yes	96 (84.2%)	57 (86.4%)	39 (81.2%)	
When do you start medical nutrition (enteral or parenteral nutrition)?				
When the patient cannot eat at all	35 (21.6%)	20 (22.5%)	15 (20.5%)	0.917
Other	12 (7.41%)	8 (8.99%)	4 (5.48%)	0.584
Do you consider immuno-nutrition for the patients with upper gastrointestinal cancers?				1
No	70 (66.0%)	39 (66.1%)	31 (66.0%)	
Yes	36 (34.0%)	20 (33.9%)	16 (34.0%)	
When do you start enteral nutrition postoperatively?				0.022
POD0 (postoperative day 0)	21 (18.6%)	14 (21.2%)	7 (14.9%)	
POD1	43 (38.1%)	31 (47.0%)	12 (25.5%)	
POD2	18 (15.9%)	11 (16.7%)	7 (14.9%)	
POD3	16 (14.2%)	6 (9.09%)	10 (21.3%)	
POD4	7 (6.19%)	2 (3.03%)	5 (10.6%)	
≥POD5	8 (7.08%)	2 (3.03%)	6 (12.8%)	

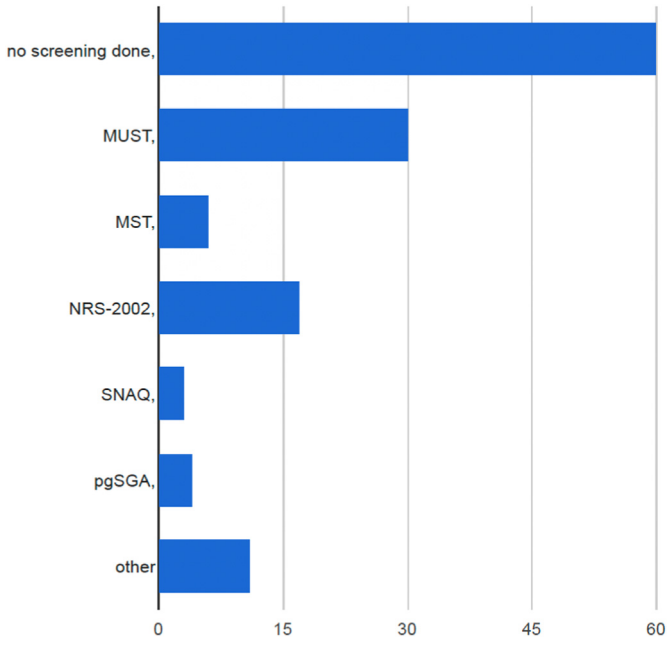

Fig. 1. Which screening tools are used?.

restriction was 6 h (31.3%), followed by 2 h (26.1%), 8 h (13.9%) and 12 h (9.6%). Preoperative food restrictions also varied, ranging from 6 (22.6%), 8 (19.1%) and 12 h (28.7%) to avoiding food intake from midnight on the day of the surgery (24.3%).

If severe malnutrition is diagnosed before surgery, respondents report that, on average, surgery is postponed 55.4% of the time to treat malnutrition first. When analysing by geographic region, this was more likely to happen in the ROW (69.1%) than in Europe (45.3%), $p < 0.001$.

Most reported starting enteral nutrition by POD1 (38.1%), with 18.6% starting on POD0, 15.9% on POD2 and 14.2% on POD3. This pattern was not statistically significant across specialty groups (colorectal/GI/general/HPB vs. all others), but there was a significant difference between geographic regions (Europe vs. ROW) where 68.2% started enteral nutrition by POD1 in Europe, compared to 40.4% in ROW. For those treating upper GI cancer patients, most did not consider immune-nutrition (66.0%).

3.5. Two clinical scenarios

In total 110 (54.7%) of the respondents answered the two clinical cases. Interestingly, 15 (13.6%) participants would not assess or screen the patient with dysphagia, 10 kg weight loss due to a moderately differentiated squamous cell carcinoma of the oesophagus, while 67 (60.9%) would not assess the patient with breast cancer. Regarding the nutritional supplements, the vast majority (n = 107, 97.3%) would offer supplements to the patient with oesophageal cancer (oral: 50.9%; parenteral 46.4%), and 51 respondents (46.4%) supplements for the patient with breast cancer (oral: 43.6%; parenteral 2.7%; Fig. 2).

4. Discussion

Nutritional status in cancer patients is a dynamic parameter that is influenced by age, social factors, comorbidities, treatment setting, tumour site and stage, and the type of treatment the patient is receiving [5]. Malnutrition varies between 15 and 40% at cancer diagnosis and 40–80% during systemic treatment, with the highest reported rates for gastroesophageal (75%) and pancreatic tumours

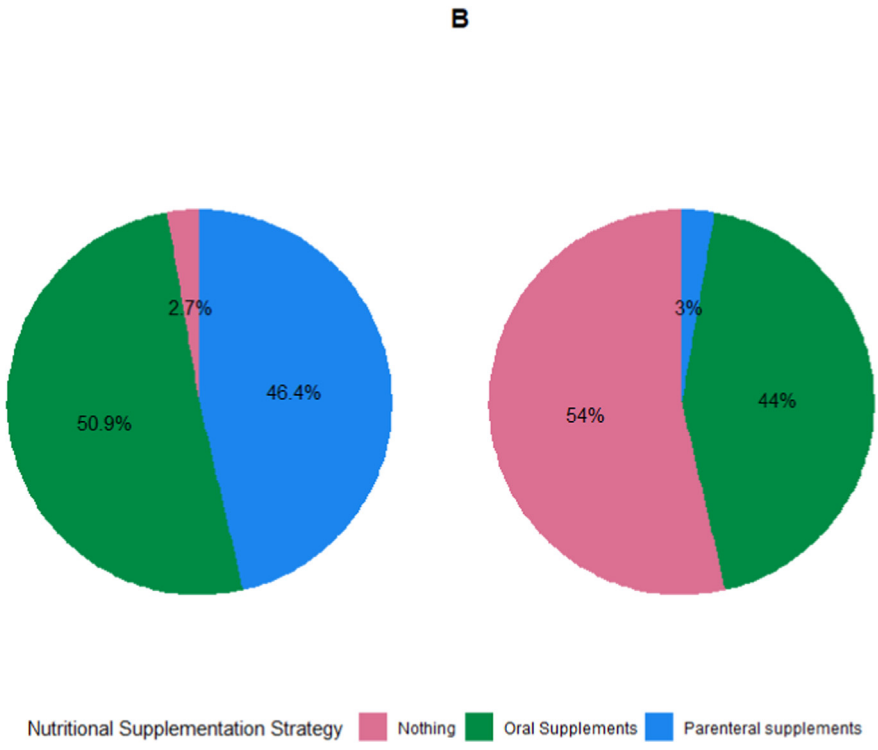

Fig. 2. Nutritional supplementation strategy. A: Scenario 1. Oesophageal cancer; B: Scenario 2. Breast cancerTables

(70.6%) [5]. The present study showed that around 52–55% of cancer patients were reported to be at risk of having malnutrition. Despite this, we have identified some facts that deserve careful consideration. Firstly, less than half of cancer patients are seen by a dietitian, regardless of the setting and specialty. Secondly, around 60% of medical reports do not include information about the patient's nutritional status and treatment, even in patients at risk of malnutrition. Thirdly, severe malnutrition precludes surgery in only around 55% of cases, with possibly deleterious effects for the patient, especially outside Europe (ROW). Lastly, there is still a wide variety in practice regarding fluid and food restrictions before cancer surgery, meaning that guidelines recommendations are not universally followed. As such, active and continuous surveillance combined with a tailored approach are essential for cancer patients' management [5,18,19].

The most commonly used tools by the participants of this nutritional screening were MUST (21%), followed by the Nutritional Risk Screening (NRS) (10%) tool. The MUST allows the usage of substitute parameters like ankle-knee length and supine body length for height, or recent known weight where measurement is not possible. This can be an advantage to reliably assess acute changes in nutritional status, especially in elderly or frail populations. In contrast, NRS is a simple and quick tool that considers weight loss and food intake, which can be more open to recall bias regarding the usual/ideal weight, especially in elderly patients. As there are numerous screening tools available, there has not been a clear consensus towards one specific tool in a recent systematic review in gastrointestinal cancer patients. Key characteristics of good screening tools are validity and reliability. NRS-2002 and Malnutrition Screening Tool (MST) have been frequently proposed in national screening programs and gastrointestinal cancer patients [20,21].

There is a wide range of different screening tools in practice to evaluate sarcopenia, like the patient's gait speed (<0.8 m/s), handgrip strength, or questionnaires such as the SARC-F [22]. Due to recent technical developments, computer tomography scans of cancer patients are used more and more often – even fully automated to assess sarcopenia with high predictive value for both short-term and long-term outcome in gastrointestinal cancer patients [23]. These achievements should make it much easier to use and implement sarcopenia assessment across the board without the need of additional human resources.

Poor nutritional status represents a modifiable risk factor for surgery since it increases the postoperative morbidity and the length of hospital stay [24].

All cancer patients require prior nutritional counselling in the preoperative phase, whereas malnourished patients require a protein-calorie rich diet, immune-nutrition supplementation for gastrointestinal cancer surgery, and even probiotics or symbiotics for colon cancer surgery [18,25,26]. Our study highlights that preoperative nutritional assessment is not standard and is only routinely performed in 37% of participating centers. In addition, the survey reveals an interesting discrepancy between assessment and treatment, which was demonstrated in the responds in the clinical case section. A patient with squamous oesophageal cancer suffering from dysphagia and 10 kg weight loss, who is generally considered to be in need of preoperative nutritional support, would have been prescribed supplements in 97.3% of cases (oral: 50.9%; parenteral 46.4%), but 29.1% of participants would not screen or assess the nutritional status. This suggests that nutritional screening is not a standard, and is resource intensive, as one out of four would skip this step and move forward to applying nutritional support without assessment.

ESPEN guidelines recommend 7–14 days of delayed surgery with nutritional replenishment for cancer patients with weight loss of >10% in the past six months, BMI loss of 5 [27]. In our study only 55% of participants would have postponed surgery due to severe malnutrition.

Besides early preoperative nutrition care, late preoperative nutritional support should be provided appropriately. According to the ESPEN guidelines, in patients with no risk of aspiration, solid food is given 6 h before surgery and liquids are given 2 h before

surgery [27,28]. Most of the participants apply a 6-h and or a 2-h fluid deprivation prior to surgery (31% and 26% respectively), and the majority recommend a preoperative fasting period over 6 h (77.4%).

Nutritional support administered in cancer patients in the postoperative period has a protective effect on clinical outcome [29]. In clinical practice, oral nutrition is the preferred route of feeding since it remains a significant part of the patient's daily routine and does contribute substantially to the patients' autonomy. Few studies indicated that oral nutrition, including oral nutrition supplements (ONS) and/or a hospital-balanced meal, can be delivered immediately after surgery [30,31]. However, ESPEN guidelines recommend that oral intake should start after surgery as tolerated, after assessing individual tolerance [25,27]. Most participants comply with these guidelines and start enteral feeding until POD1 (n = 64, 58.2%).

Preoperative screening is advised by most Early Recovery After Surgery (ERAS) societies as part of prehabilitation optimisation. Responders of our survey estimated that preoperative nutritional assessment was done in about 47% of patients. Most of them (69%) answered that surgeons are responsible for assessing preoperative nutritional status and more than half (55.4%) of responders would postpone a cancer surgery due to preoperatively identified severe malnutrition. The tendency to postpone surgery was higher in ROW compared to Europe, to which point the authors cannot offer any solid explanation. Nutritional assessment should ideally be done repeatedly at different key points – at the time of diagnosis, before starting the anticancer treatment, prior to surgical intervention, but also during hospital admission followed by monitoring after discharge. Despite the significant nutritional demands in postoperative period, as well as possible delayed transition to enteral feeding or requirements for parenteral nutrition, the responders stated that only around 62% of patients get to be assessed during hospitalization. The number of patients monitored after discharge further declines to 40%. Nutritional information on medical records or discharge letters was estimated to be provided in 38.1% of cases. This is certainly an area for improvement as high-risk patients should be closely monitored even after discharge. Furthermore, there is often discrepancy between information on discharge and patients' understanding, which may lead to poor patients' compliance with dietary advice. The results of our survey are based on respondents' estimations of their practice. Local (institutional), as well as national, audits should be undertaken to obtain real-world data and identify unsupported areas. Organisational factors, such as competing priorities, training, education, and discrepancy between recommendations and practice have been identified in previous studies [32]. The specific barriers to nutritional care might vary across institutions. However, implementation of standardised pathways and regular monitoring of practice might improve both clinicians' and patients' compliance.

This study is limited by the nature of a snapshot study and its exposure to responder bias. The overall response rate was low, but this may reflect the broad group that the survey was sent to. If there is a significant contribution of responder bias, screening for malnutrition may be even lower than that reported in this study. Another aspect is that a majority of respondents were from university/teaching hospitals (78.5%), who most likely have access to relatively higher resources to assess and treat malnutrition compared to the national standards. The other possibility is that nutritional assessments are undertaken without direct input from surgical oncologists, e.g. nurse-led referrals to dietitian and nursing MUST assessments, which may mean that more patients are actually screened for malnutrition than what respondents in this survey estimated.

4.1. Future perspectives

This survey has highlighted deficiencies in respondents' awareness regarding screening and treatment of malnutrition in cancer patients. Raising awareness of malnutrition has the potential to improve practice and patient outcomes. The next step could be to develop an educational bundle on malnutrition for the participating centers and to repeat the survey afterwards to see if there is any improvement in the awareness and screening for malnutrition. Future studies will include a collaborative prospective snapshot audit on malnutrition in cancer patients.

CRediT authorship contribution statement

Andreas Brandl: Conceptualization, Methodology, Validation, Writing – original draft, Supervision, Writing – review & editing, Project administration. **Dara Lundon:** Conceptualization, Methodology, Validation, Software, Formal analysis, Data curation, Writing – review & editing, Visualization, Project administration. **Laura Lorenzon:** Conceptualization, Methodology, Validation, Writing – review & editing. **Yvonne Schrage:** Conceptualization, Methodology, Validation, Writing – review & editing. **Carmela Caballero:** Conceptualization, Methodology, Validation, Writing – review & editing. **Carl Jacob Holmberg:** Conceptualization, Methodology, Validation, Writing – review & editing. **Nada Santrac:** Conceptualization, Methodology, Validation, Writing – review & editing. **Henry Smith:** Conceptualization, Methodology, Validation, Writing – review & editing. **Mariela Vasileva-Slaveva:** Conceptualization, Methodology, Validation, Writing – review & editing. **Giacomo Montagna:** Conceptualization, Methodology, Validation, Writing – review & editing. **Eduard-Alexandru Bonci:** Conceptualization, Methodology, Validation, Writing – review & editing. **Olivia Sgarbura:** Conceptualization, Methodology, Validation, Writing – review & editing. **Raza Sayyed:** Conceptualization, Methodology, Validation, Writing – review & editing. **Almog Ben-Yaacov:** Conceptualization, Methodology, Validation, Writing – review & editing. **Johnn Henry Herrera Kok:** Conceptualization, Methodology, Validation, Writing – review & editing. **Ina Suppan:** Conceptualization, Methodology, Validation, Writing – review & editing. **Pallvi Kaul:** Conceptualization, Methodology, Validation, Writing – review & editing. **Dana Sochorova:** Conceptualization, Methodology, Validation, Writing – review & editing. **Nikolaos Vassos:** Conceptualization, Methodology, Validation, Writing – review & editing. **Marta Carrico:** Conceptualization, Methodology, Validation, Writing – review & editing. **Helen Mohan:** Conceptualization, Methodology, Validation, Writing – review & editing. **Wim Ceelen:** Conceptualization, Methodology, Validation, Writing – review & editing. **Jann Arends:** Conceptualization, Methodology, Validation, Writing – review & editing. **Sergio Sandrucci:** Conceptualization, Methodology, Validation, Writing – review & editing.

Acknowledgements

Special thanks to ESSO Secretariat Carine Lecoq, Ana Galan, Gemma Applebee, Shuang Gao, and Maria Popovics, all EYSAC National Representatives, and ESSO partner societies who helped in the execution and distribution of this survey.

Appendix A. Supplementary data

Supplementary data to this article can be found online at https://doi.org/10.1016/j.ejso.2023.06.005.

References

[1] Sung H, Ferlay J, Siegel RL, Laversanne M, Soerjomataram I, Jemal A, et al. Global cancer statistics 2020: GLOBOCAN estimates of incidence and mortality worldwide for 36 cancers in 185 countries. CA A Cancer J Clin 2021;71(3):209–49.

[2] Global Burden of Disease Cancer C, Kocarnik JM, Compton K, Dean FE, Fu W, Gaw BL, et al. Cancer incidence, mortality, years of life lost, years lived with disability, and disability-adjusted life years for 29 cancer groups from 2010 to 2019: a systematic analysis for the global burden of disease study 2019. JAMA Oncol 2022;8(3):420–44.

[3] Omran AR. The epidemiologic transition. A theory of the epidemiology of population change. Milbank Mem Fund Q 1971;49(4):509–38.

[4] Commission E. 2021.https://health.ec.europa.eu/system/files/2022-02/eu_cancer-plan_en_0.pdf accessed (07/07/2023).

[5] Bossi P, Delrio P, Mascheroni A, Zanetti M. The spectrum of malnutrition/cachexia/sarcopenia in oncology according to different cancer types and settings: a narrative review. Nutrients 2021;13(6).

[6] Arends J. Ernährung von Tumorpatienten. Aktuelle Ernährungsmed 2012;37(2):91–106.

[7] Cruz-Jentoft AJ, Bahat G, Bauer J, Boirie Y, Bruyere O, Cederholm T, et al. Sarcopenia: revised European consensus on definition and diagnosis. Age Ageing 2019;48(1):16–31.

[8] Jung HW, Kim JW, Kim JY, Kim SW, Yang HK, Lee JW, et al. Effect of muscle mass on toxicity and survival in patients with colon cancer undergoing adjuvant chemotherapy. Support Care Cancer 2015;23(3):687–94.

[9] Pressoir M, Desne S, Berchery D, Rossignol G, Poiree B, Meslier M, et al. Prevalence, risk factors and clinical implications of malnutrition in French Comprehensive Cancer Centres. Br J Cancer 2010;102(6):966–71.

[10] Prado CM, Baracos VE, McCargar LJ, Reiman T, Mourtzakis M, Tonkin K, et al. Sarcopenia as a determinant of chemotherapy toxicity and time to tumor progression in metastatic breast cancer patients receiving capecitabine treatment. Clin Cancer Res 2009;15(8):2920–6.

[11] Vitaloni M, Caccialanza R, Ravasco P, Carrato A, Kapala A, de van der Schueren M, et al. The impact of nutrition on the lives of patients with digestive cancers: a position paper. Support Care Cancer 2022;30(10):7991–6.

[12] Muscaritoli M, Arends J, Bachmann P, Baracos V, Barthelemy N, Bertz H, et al. ESPEN practical guideline: clinical Nutrition in cancer. Clin Nutr 2021;40(5):2898–913.

[13] Lorenzon L, Brandl A, Guiral DC, Hoogwater F, Lundon D, Marano L, et al. Nutritional assessment in surgical oncology: an ESSO-EYSAC global survey. Eur J Surg Oncol 2020;46(11):2074–82.

[14] Harris PA, Taylor R, Thielke R, Payne J, Gonzalez N, Conde JG. Research electronic data capture (REDCap)–a metadata-driven methodology and workflow process for providing translational research informatics support. J Biomed Inf 2009;42(2):377–81.

[15] Harris PA, Taylor R, Minor BL, Elliott V, Fernandez M, O'Neal L, et al. The REDCap consortium: building an international community of software platform partners. J Biomed Inf 2019;95:103208.

[16] Team RCR. A language and environment for statistical computing. 2022.

[17] Elia M. The 'MUST' report. Nutritional screening for adults: a multidisciplinary responsibility. Development and use of the 'Malnutrition Universal Screening Tool' (MUST) for adults. 2003.

[18] Lobo DN, Gianotti L, Adiamah A, Barazzoni R, Deutz NEP, Dhatariya K, et al. Perioperative nutrition: recommendations from the ESPEN expert group. Clin Nutr 2020;39(11):3211–27.

[19] Hogenbirk RNM, van der Plas WY, Hentzen J, van Wijk L, Wijma AG, Buis CI, et al. Postoperative muscle loss, protein intake, physical activity and outcome associations. Br J Surg 2023;110(2):183–92.

[20] Totland TH, Krogh HW, Smedshaug GB, Tornes RA, Bye A, Paur I. Harmonization and standardization of malnutrition screening for all adults - a systematic review initiated by the Norwegian Directorate of Health. Clin Nutr ESPEN 2022;52:32–49.

[21] Deftereos I, Djordjevic A, Carter VM, McNamara J, Yeung JM, Kiss N. Malnutrition screening tools in gastrointestinal cancer: a systematic review of concurrent validity. Surg Oncol 2021;38:101627.

[22] Malmstrom TK, Morley JE. SARC-F: a simple questionnaire to rapidly diagnose sarcopenia. J Am Med Dir Assoc 2013;14(8):531–2.

[23] Su H, Ruan J, Chen T, Lin E, Shi L. CT-assessed sarcopenia is a predictive factor for both long-term and short-term outcomes in gastrointestinal oncology patients: a systematic review and meta-analysis. Cancer Imag 2019;19(1):82.

[24] Zhong JX, Kang K, Shu XL. Effect of nutritional support on clinical outcomes in perioperative malnourished patients: a meta-analysis. Asia Pac J Clin Nutr 2015;24(3):367–78.

[25] Arends J, Bachmann P, Baracos V, Barthelemy N, Bertz H, Bozzetti F, et al. ESPEN guidelines on nutrition in cancer patients. Clin Nutr 2017;36(1):11–48.

[26] Brajcich BC, Stigall K, Walsh DS, Varghese TK, Barber AE, Kralovich KA, et al. Preoperative nutritional optimization of the oncology patient: a scoping review. J Am Coll Surg 2022;234(3):384–94.

[27] Weimann A, Braga M, Carli F, Higashiguchi T, Hubner M, Klek S, et al. ESPEN practical guideline: clinical nutrition in surgery. Clin Nutr 2021;40(7):4745–61.

[28] Weimann A, Braga M, Carli F, Higashiguchi T, Hubner M, Klek S, et al. ESPEN guideline: clinical nutrition in surgery. Clin Nutr 2017;36(3):623–50.

[29] Bozzetti F, Gianotti L, Braga M, Di Carlo V, Mariani L. Postoperative complications in gastrointestinal cancer patients: the joint role of the nutritional status and the nutritional support. Clin Nutr 2007;26(6):698–709.

[30] Bickel A, Shtamler B, Mizrahi S. Early oral feeding following removal of nasogastric tube in gastrointestinal operations. A randomized prospective study. Arch Surg 1992;127(3):287–9. ; discussion 9.

[31] Petrelli NJ, Stulc JP, Rodriguez-Bigas M, Blumenson L. Nasogastric decompression following elective colorectal surgery: a prospective randomized study. Am Surg 1993;59(10):632–5.

[32] Green SM, James EP. Barriers and facilitators to undertaking nutritional screening of patients: a systematic review. J Hum Nutr Diet 2013;26(3):211–21.