CLINICAL NUTRITION
DOI: 10.12957/demetra.2022.61445

DEMETRA
Alimentação, Nutrição & Saúde

Nathaly Esperidião de Melo[1]
Jaíne Teixeira Bezerra[1]
Patrícia Brazil Pereira Coelho[2]
Celina de Azevedo Dias[2]
Maria Izabel Siqueira de Andrade[3]
Janatar Stella Vasconcelos de Melo Me Mpomo[2]

[1] Universidade Federal de Alagoas. Hospital Universitário Professor Alberto Antunes. Programa de Residência Multiprofissional em Saúde do Adulto e do Idoso. Maceió, AL, Brasil.

[2] Universidade Federal de Alagoas. Hospital Universitário Professor Alberto Antunes. Unidade de Nutrição Clínica. Maceió, AL, Brasil.

[3] Universidade Federal de Alagoas. Faculdade de Nutrição. Maceió, AL, Brasil.

Correspondence
Janatar Stella Vasconcelos de Melo Me Mpomo
janatarstella@hotmail.com

Nutritional risk and postoperative complications in cancer patients

Risco nutricional e complicações pós-operatórias em pacientes oncológicos

Abstract

Introduction: Malnutrition has been associated with a poorer prognosis in cancer patients. Thus, the early assessment of nutritional risk in these patients is fundamental. ***Objective***: To identify associations between nutritional risk and postoperative complications in cancer patients. ***Method***: An analytical, observational, longitudinal study was conducted with cancer patients undergoing surgical treatment at a public university hospital in December 2019. Preoperative nutritional risk was assessed using the Nutritional Risk Screening-2002. Variables related to surgery (severity, temporal classification of the procedure, postoperative complications, total hospital stay and postoperative hospital stay) were also collected. ***Results***: Eighty-eight patients were included, 51.1% of whom were adults and 64.8% were female. Nutritional risk was found in 28.4% (n = 25) of patients. The procedures performed were mainly elective (83.1%) and more severe (53.9%). The most frequent category of surgery was miscellaneous, followed by coloproctological, urological and gastric surgeries. Significant associations were found between nutritional risk and both total and postoperative hospital stay ($p < 0.05$). After the surgical interventions, 11.4% (n = 10) of patients at nutritional risk had complications and a marginally significant association was found between nutrition and postoperative pain ($p < 0.10$). ***Conclusion***: Nutritional risk in cancer patients identified in the preoperative period was associated with complications following the surgical procedure and a longer hospital stay. The adoption of nutritional screening methods is recommended so that appropriate interventions are implemented as early as possible.

Keywords: Surgical oncology. Malnutrition. Postoperative complications.

Resumo

Introdução: A presença de desnutrição em pacientes oncológicos tem sido associada a um pior prognóstico. Assim, torna-se fundamental o rastreio do risco de desnutrição de forma precoce nestes indivíduos. ***Objetivo***: Identificar a associação entre risco nutricional e presença de complicações pós-operatórias em pacientes oncológicos. ***Método***: Trata-se de um estudo analítico, observacional, de caráter longitudinal, realizado com pacientes cirúrgicos oncológicos atendidos em um hospital universitário público no Nordeste brasileiro no período de outubro a dezembro de 2019. Foram coletadas em prontuário variáveis relacionadas a sexo, idade, risco nutricional, através do *Nutritional Risk Screening*-2002, além de variáveis cirúrgicas referentes a severidade, classificação temporal do procedimento, complicações pós-operatórias, tempo de internamento total e pós-operatório. ***Resultados***: Foram incluídos 88 pacientes, dos quais 51,1% eram adultos e 64,8% do sexo feminino. Constatou-se risco nutricional em 28,4% (n=25) dos pacientes. Os procedimentos realizados foram, em sua maioria, cirurgias eletivas (83,1%) e de maior severidade

(53,9%). As cirurgias realizadas com maior frequência foram miscelâneas, seguidas de intervenções da área de coloproctologia, urologia e cirurgias gástricas. Houve diferença significativa entre risco nutricional e o tempo de internamento total e pós-operatório ($p<0,05$). Após a intervenção cirúrgica, 11,4% (n=10) dos pacientes evoluíram com complicações, havendo uma significância marginal para a associação entre risco nutricional e dor no pós-operatório ($p<0,10$). ***Conclusão*:** O risco nutricional detectado no período pré-operatório contribuiu para a verificação de complicações álgicas no momento posterior ao procedimento cirúrgico e para a permanência hospitalar mais prolongada em pacientes oncológicos. Recomenda-se a adoção de métodos de rastreio nutricional para que intervenções apropriadas sejam implantadas precocemente.

Palavras-chave: Cirurgia oncológica. Desnutrição. Complicações pós-operatórias.

INTRODUCTION

Malnutrition is highly prevalent among cancer patients. Indeed, approximately 80% of such patients are malnourished at the time of diagnosis. This malnutrition generally occurs due to an imbalance between food intake and nutritional needs. However, the etiology of malnutrition in such cases is also multifactorial, as it may be a consequence of the side effects of cancer treatment and/or metabolic changes, the location of the tumor and disease stage.[1,2]

Patients with malignant tumors may also have a high production of inflammatory cytokines, such as interleukin 1, interleukin 6, tumor necrosis factor alpha and gamma interferon, the increased secretion of which can lead to anorexia and cachexia.[3]

Malnutrition in cancer patients has been associated with a poorer prognosis and should therefore be prevented or detected early to diminish or eliminate the occurrence of clinical complications, morbidity and moratality.[4] Thus, nutritional screening is of considerable importance, as it enables the early identification of the risk of malnutrition, and is recommended soon after admission to hospital.[5] Different methods are used to assess nutritional risk. The Nutritional Risk Screening-2002 (NRS-2002) tool was designed for the hospital setting and considers recent weight loss and changes in food intake, with adjustments for patients older than 70 years of age.[6,7]

Considering the influence of nutritional status on the clinical and surgical evolution of hospitalized patients, especially those undergoing surgical oncological treatment, the aim of the present study was to identify associations between preoperative nutritional risk and postoperative complications in cancer patients at a public hospital in northeastern Brazil.

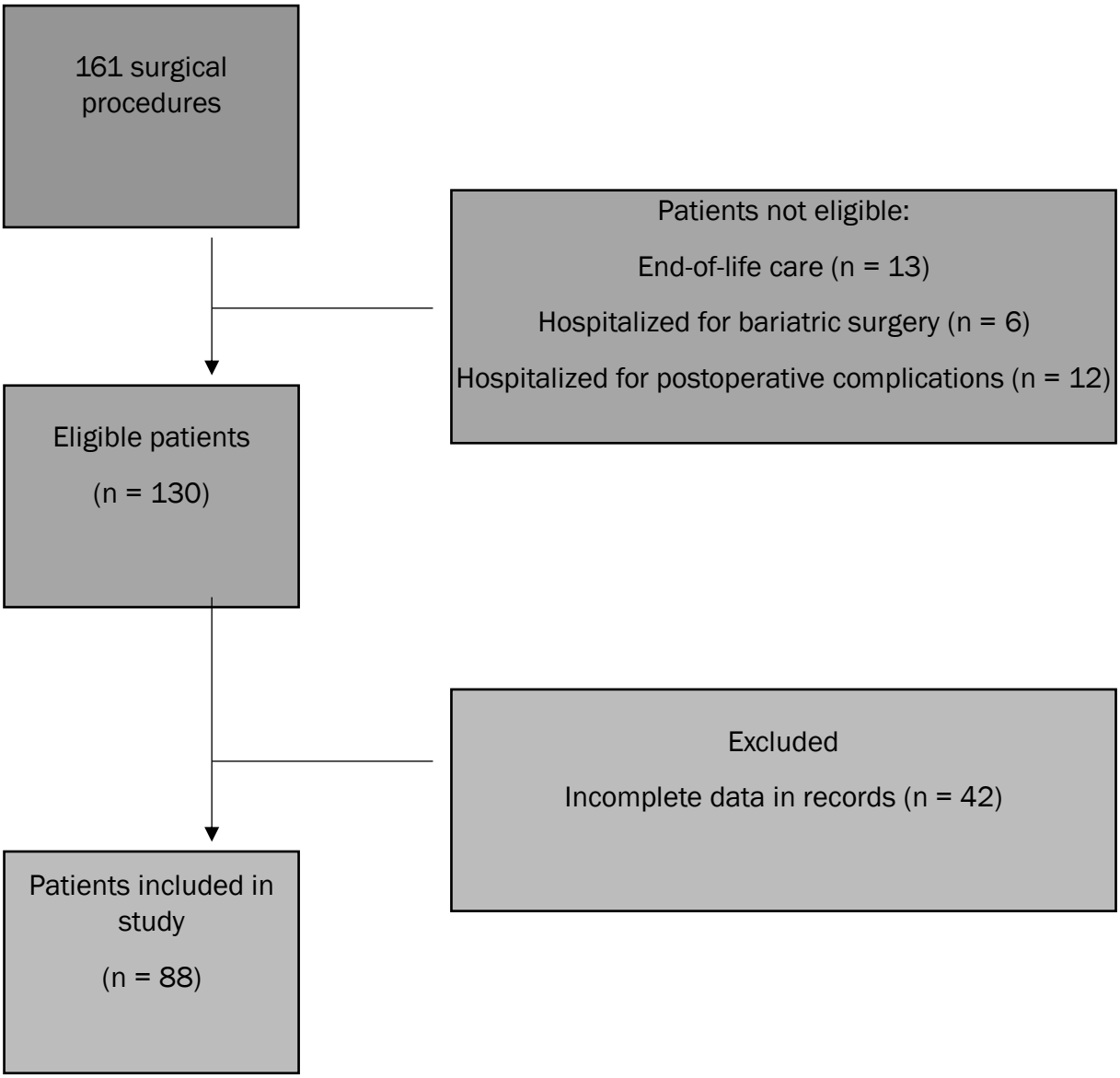
METHODS

Study design and population

An observational, analytical, longitudinal study was conducted between October and December 2019 using data from the records of cancer patients in the surgical ward of the Professor Alberto Antunes Hospital affiliated with the Federal University of Alagoas in the city of Maceió, Brazil. This study received approval from the Human Research Ethics Committee of the university (certificate number: 3.606.127).

A total of 161 oncological surgical procedures were performed in the study period. Non-probabilistic sampling was performed, with the inclusion of individuals hospitalized in the period between October and December 2019 who met the following preestablished eligibility criteria: age 20 years or older, having undergone surgery during the period of hospitalization and records of screening for nutritional risk in the first 24 to 72 hours after admission to hospital. Pregnant women, nursing mothers, patients under end-of-life care and those hospitalized due to postoperative complications were excluded from the study. Based on these criteria, a total of 130 patients were considered eligible. However, the records of 42 patients were incomplete. Thus, the final sample was composed of 88 patients (Figure 1).

Figure 1. Flowchart of patient selection process based on eligibility criteria. Maceió, Brazil, 2019.



Demographic variables

For the characterization of the sample, data were collected on the sex and age of the patients. Individuals 20 to 59 years of age were categorized as adults and those ≥ 60 years of age were categorized as older people

Nutritional risk and body mass index

The NRS 2002 was used for the determination of nutritional risk. Screening was performed by duly trained nutritionists at the hospital on all patients in the surgical work in the first 24 to 72 hours after admission. Risk was determined using the cutoff points established by Kondrup et al.,[7] with a score of ≥ 3 points considered indicative of nutritional risk.

Body mass index was categorized using the values proposed by the World Health Organization[8] and Lipschitz[9] for adults and older people, respectively. Due to the sample size, three categories were considered for this variable: underweight (<18.5 kg/m^2 for adults and < 22 kg/m^2 for older people), ideal range (18.5 to 24.9 kg/m^2 for adults and 22 to 27 kg/m^2 for older people) and excess weight (overweight and obesity) (≥ 25 kg/m^2 for adults and > 27 kg/m^2 for older people).

Surgical variables

Data related to the type of surgery were collected directly from the patient records. For the purposes of classification, surgeries were grouped as follows: coloproctological, urological, gastric, gynecological, neurological, head & neck, exploratory laparotomy, esophageal and miscellaneous (multiple surgeries, lymphadenectomy, drainage of secretion, video-assisted laparoscopy and debridement). This information enabled classifying the severity of surgery based on Stefani et al.[10] and the temporal classification of the surgical procedure as proposed by Fleisher et al.,[11] which was dichotomized as elective or urgent surgery. Total hospital stay and postoperative hospital stay were also evaluated.

Postoperative complications

The Postoperative Morbidity Survey[12] was used to evaluate postoperative complications. This scale is composed of nine domains addressing morbidity according to the presence/absence of preestablished criteria: pulmonary, infectious, gastrointestinal, cardiovascular, neurological, hematological, related to the surgical wound and pain.

Análise estatística

The data were entered onto an Excel® spreadsheet and analyzed with the aid of the SPSS program, version 13.0 for Windows (SPSS Inc., Chicago, IL, USA). The Kolmogorov-Smirnov test was used to determine the distribution of continuous variables and those with normal distribution were expressed as mean and standard deviation. In the description of proportions, binomial distribution was approximated to normal distribution by 95% confidence intervals and significant differences were considered when there was no overlap of the respective confidence intervals. Fisher's exact test was used for to test associations between proportions and the Student's t-test was used for the analysis of differences between means. The level of significance was set at 5% ($p \leq 0.05$) for all analyses and marginal significance was determined when the p-value was ≤0.10.

RESULTS

One hundred sixty-one oncological surgeries were performed in the study period. Eighty-eight patients met the inclusion criteria and were included in the present study. Mean age was 58.0 ± 14.9 years and 51.1% (n = 45) of the participants were between 20 and 59 years of age. Women accounted for the majority of the sample (64.8%; n = 57). Nutritional risk determined using the NRS-2002 was found in 28.4% (n = 25). Other data for the characterization of the sample are displayed in Table 1. Most surgical procedures were classified as elective (83.1%; n = 69) and of greater severity (53.9%; n = 41).

Table 1. Characterization of sample of oncological surgical patients at a university hospital in northeast Brazil. Maceió, 2019.

Variables	N= 88
Female sex (%)	64.8
Age (years)	58.0±14.9
Body mass index (kg/m^2)	26.06±5.51
20 to 59 years of age (%)	51.1
Nutritional risk (%)	28.4
Without postoperative complications (%)	88.6
Excess weight (kg/m^2) (%)	50.2
Elective surgery (%)	83.1
Surgery of greater severity (%)	53.9

BMI: body mass index.

As association was found between nutritional risk and hospital stay. Both overall hospital stay and postoperative hospital stay were longer among patients with nutritional risk determined by the NRS-2002 (Table 2)

Table 2. Difference in hospital stay according to nutritional risk in oncological surgical patients at a university hospital in northeast Brazil. Maceió, 2019.

Variables	(Mean and SD) (n = 88)	With nutritional risk (Mean and SD) (n = 25)	Without nutritional risk (Mean and SD) (n = 63)	*p-value**
Total hospital stay (days)	8.88±10.16	13.48±11.69	7.06±8.94	0.007*
Postoperative hospital stay (days)	6.46±9.23	9.88±11.63	5.11±7.79	0.028*

SD: standard deviation

p-value determined using Student's t-test. *p <0.05

After the surgical intervention, 11.4% (n = 10) of the patients had complications, the most frequent of which were pulmonary (60%; n = 6) and infectious (40%; n = 4). Other complications were identified in 2.3% (n = 2) of the patients, such as pain, cardiovascular events and renal events as well as neurological, gastrointestinal, hematological and related to the surgical wound, which were found in 1.1% (n = 1) of the sample. Among the patients with complications, 50% (n = 5) had some degree of nutritional risk.

An association of marginal significance was found between nutritional risk and postoperative pain (p = 0.078), as this outcome was less frequent among individuals without nutritional risk (Table 3).

Table 3. Associations between nutritional risk and postoperative complications in oncological surgical patients at a university hospital in northeast Brazil. Maceió, 2019.

Complications	*Nutritional Risk Screening* - 2002				*p*-value*
	With risk		Without risk		
	n	%	n	%	
Infectious					
Yes	1	4	3	4.76	1.000
No	24	96	60	95.23	
Pulmonary					
Yes	1	4	5	7.93	0.670
No	24	96	58	92.06	
Renal					
Yes	1	4	1	1.58	0.490
No	24	96	62	98.41	
Gastrointestinal					
Yes	1	4	0	0	0.284
No	24	96	63	100	
Cardiovascular					
Yes	1	4	1	1.58	0.490
No	24	96	62	98.41	
Neurological					
Yes	1	4	0	0	0.284
No	24	96	63	100	
Hematological					
Yes	1	4	0	0	0.284
No	24	96	63	100	
Surgical wound					
Yes	0	0	1	1.58	1.000
No	25	100	62	98.41	
Pain					
Yes	2	8	0	0	0.078*
No	23	92	63	100	

p-value determined using Fisher's exact test. *p <0.05

DISCUSSION

The literature offers few descriptions of postoperative complications in patients submitted to oncological surgeries. Therefore, the present study describes such data in a sample of patients at a university hospital.

The sample was equally distributed among adults and older people. Regarding sex, however, women predominated. Cantão et al.[13] detected a greater frequency of cancer in adults and older people between 51 and 80 years of age, which may be explained by the fact that aging is one of the risk factors for the occurrence of tumors.[13] The greater frequency of women in the present study may be related to the greater concern for

health and the greater likelihood of seeking healthcare services among women compared to the male population.[14]

The majority of procedures were elective and of greater severity and the most frequent were in the miscellaneous category, followed by coloproctological, urological and gastric surgeries. The high incidences of colorectal, prostate and stomach cancer currently found in Brazil may explain the greater number of these types of surgeries.[15]

Malnutrition and the loss of lean mass in cancer patients may be caused by inadequate food intake, a reduction in physical activity and metabolic disorders, which are associated with an unfavorable prognosis, with a poorer response to cancer treatment and a reduction in quality of life, causing changes in the patient's general health state and wellbeing.[16]

The prevalence of malnutrition is high among cancer patients in the hospital setting. An estimated 42% of cancer patents hospitalized in Brazil have some degree of recent weight loss and 45% are hospitalized malnourished or at risk of malnutrition; this percentage varies depending on the disease stage and location of the tumor.[17]

Malnutrition or the risk of malnutrition is often not detected at the time of admission to hospital. However, considering the harm caused by this condition, nutritional screening is fundamental to the follow up of these patients and the establishment of intervention measures for those considered to be at risk.[5,18] Thus, nutritional screening enables the early detection of patients who require nutritional care, as the hospital routine hinders a detailed nutritional assessment of all patients. Among the different methods for determining nutritional risk, healthcare providers should choose that which better detects the nutritional problem of the population being studied.[19,20]

One of the advantages of the NRS-2002[7] is the capacity to relate nutritional status to the severity of the disease. Compared to other methods, this instrument is effective at identifying nutritional risk in adult patients hospitalized for clinical or surgical reasons. In 2003, the NRS-2002 was officially adopted by the European Society for Parenteral and Enteral Nutrition for the detection of the risk of hospital malnutrition. Moreover, this instrument can be considered the most recommended, as it does not exclude any specific group and can be used with cancer patients, as done in the present investigation.[5,21]

A total of 28.4% of the patients in this study were at nutritional risk. In a similar study that evaluated the association between nutritional risk determined using the NRS-2002 and complications following gastrointestinal surgery, Schiesser et al.[22] found a 40% rate of nutritional risk in cancer patients. Variations in the prevalence of nutritional risk among studies may be due to the disease stage in the sample and the type of surgeries performed. Santos et al.[23] detected a significant association with the location of the tumor, as the prevalence of nutritional risk was higher among patients with hematological, gastrointestinal, lung and pancreatic cancer. In a study conducted by Lotici et al.,[24] weight loss was more prevalent in patients with tumors in the pancreas (20.9%), digestive tract (13%), lung (10.75%) and head & neck (8.8%); moreover, approximately 60% of the patients were diagnosed with cachexia.

Malnourished patients have higher rates of morbidity and mortality in the postoperative period compared to patients with a good nutritional status. Involuntary weight loss is a predictor of postoperative complications. Complications such as surgical wound infection, dehiscence of the anastomosis, sepsis and healing difficulties are more frequent in cases of weight loss and are also associated with the speed of the loss.[25]

The complication rate in the present study was similar to that reported by Pañella et al.,[26] who found that 14% of cancer patients submitted to surgery had complications during hospitalization, such as hemoperitoneum, intra-abdominal abscess, peritonitis, sepsis and suture dehiscence as well as other minor in-hospital complications. In a study conducted by Rodrigues et al.,[27] nutritional risk was significantly associated with the risk of an infectious complication, the prevalence of which was nearly fivefold greater among patients at nutritional risk. In the present study, no significant associations were found between preoperative nutritional risk and postoperative complications. However, patients at nutritional risk had a greater tendency of postoperative pain (marginal significance, $p < 0.10$), which was sufficient to require parenteral opioids or regional analgesia.

Postoperative pain is of considerable importance, as it is associated with immobilization after surgery and, consequently, a slower recovery, greater morbidity, a longer hospital stay and an increased risk of other complications, such as nausea, vomiting, paralytic ileum, thromboembolic and pulmonary events, delirium, cognitive dysfunction and sleep disorders.[28]

Hospital stay was significantly longer among the patients at nutritional risk in the present study. Previous studies also found that impaired nutritional status in hospitalized patients was associated with a longer hospital stay, which, in turn, is associated with an increase in hospital costs.[27,29]

Burden et al.[30] investigated the nutritional status of patients with colorectal cancer in the preoperative period. The authors found that more than half of the population studied has lost weight prior to surgery and those with weight loss greater than 10% had a longer hospital stay. These findings underscore the importance of nutritional screening to identify patients with weight loss in an early stage, enabling the early establishment of a nutritional intervention, which would reduce the occurrence of postoperative morbidity and lower hospital costs related to surgical patients.[31]

CONCLUSION

Nutritional risk in the preoperative period was associated with a longer hospital stay among cancer patients submitted to surgery. However, no associations were found between nutritional risk and postoperative complications in this study. Nutritional screening methods are recommended so that appropriate measures can be taken to ensure the stability of nutritional status and more favorable outcomes, with consequent reductions in the length of hospitalization, hospital costs and the occurrence of complications in cancer patients submitted to surgical procedures

REFERENCES

1. Smiderle CA; Gallon, CW. Desnutrição em oncologia: revisão de literatura. Rev Bras Nutr Clin 2012; 27(4):250-6.

2. Camargo DAP, Delfín LN , Ñamendys-Silva SA, Mendoza ETC, Méndez MH, Gómez HÁ, García AM . Estado nutricional de los pacientes con cáncer de cavidad oral. Nutr. Hosp. [Internet]. 2013; 28(5):1458-1462. Doi: 10.3305/nh.2013.28.5.6517

3. Gomes NS, Maio R. Avaliação Subjetiva Global Produzida pelo Próprio Paciente e Indicadores de Risco Nutricional no Paciente Oncológico em Quimioterapia. Revista Brasileira de Cancerologia; 61(3):235-242, 2015.

4. Fruchtenicht AVG, Poziomyck AK, Kabke GB, Loss SH, Antoniazzi JL, Steemburgo T et al. Avaliação do risco nutricional em pacientes oncológicos graves: revisão sistemática. Rev. bras. ter. intensiva. 2015;27(3):274-283. Doi: 10.5935/0103-507X.20150032

5. Lima KVG, Lima LG, Bernardo EMQV, Almeida PAC, Santos EMC; Prado, LVS. Relação entre o instrumento de triagem nutricional (NRS-2002) e os métodos de avaliação nutricional objetiva em pacientes cirúrgicos do Recife (Pernambuco, Brasil). Nutr. clín. diet. hosp. 2014;34(3):72-79. Doi: 10.12873/343gomesdelima

6. Castillo-Martínez L, Castro-Eguiluz D, Copca-Mendoza ET, Pérez-Camargo DA, Reyes-Torres CA, Ávila EA, López-Córdova G, Fuentes-Hernández MR, Cetina-Pérez L, Milke-García MDP. Nutritional Assessment Tools for the Identification of Malnutrition and Nutritional Risk Associated with Cancer Treatment. Rev Invest Clin. 2018;70(3):121-125. Doi: 10.24875/RIC.18002524. PMID: 29943772.

7. Kondrup J, Allison SP, Elia M, Vellas B, Plauth M. ESPEN (European Society for Parenteral and Enteral Nutrition) guidelines for nutrition screening 2002. Clin Nutr. 2003;22(4):415-21. doi: 10.1016/s0261-5614(03)00098-0. PMID: 12880610.

8. World Health Organization. Physical status: The use and interpretation of anthropometry. WHO Technical Report Series nº 856. Geneva: World Health Organization; 1995.

9. Lipschitz DA. Screening for nutritional status in the elderly. Prim Care. 1994 mar;21(1):55-67. PMID: 8197257.

10. Stefani LC, Gutierrez CS, Castro SMJ, Zimmer RL, Diehl FP, Meyer LE, Caumo W. Derivation and validation of a preoperative risk model for postoperative mortality (SAMPE model): An approach to care stratification. PLoS One. 2017 Oct 30;12(10):e0187122. Doi: 10.1371/journal.pone.0187122. PMID: 29084236.

11. Fleisher LA, Fleischmann KE, Auerbach AD, Barnason SA, Beckman JA, Bozkurt B et al. 2014 ACC/AHA guideline on perioperative cardiovascular evaluation and management of patients undergoing noncardiac surgery: executive summary: a report of the American College of Cardiology/American Heart Association Task Force on Practice Guidelines. Circulation. 2014 Dec 9;130(24):2215-45. Doi: 10.1161/CIR.0000000000000105. PMID: 25085962.

12. Grocott MP, Browne JP, Van der Meulen J, Matejowsky C, Mutch M, Hamilton MA, Levett DZ, Emberton M, Haddad FS, Mythen MG. The Postoperative Morbidity Survey was validated and used to describe morbidity after major surgery. J Clin Epidemiol. 2007 Sep;60(9):919-28. Doi: 10.1016/j.jclinepi.2006.12.003. PMID: 17689808.

13. Cantão BCG, Lima AB, Cruz AC, Cantão JLF, Batista Neto JBS, Cunha JF, et al. Perfil Epidemiológico dos Pacientes com Câncer Atendidos na Unidade de Alta Complexidade em Oncologia Dr. Vitor Moutinho no Município de Tucuruí-PA. Braz. J. of Develop. 2020: 6(3): 16410-16429. DOI: 10.34117/bjdv6n3-494

14. Carneiro LMR, Santos MPA, Macena RHM, Vasconcelos TB. Atenção integral à saúde do homem: um desafio na atenção básica. Rev Bras Promoç Saúde. 2016;29(4):554-563. Doi: 10.5020/18061230.2016.p554

15. Instituto Nacional de Câncer José Alencar Gomes da Silva. Estimativa 2020: incidência de câncer no Brasil. Rio de Janeiro: INCA; 2019.

16. Arends J, Bachmann P, Baracos V, et al. ESPEN guidelines on nutrition in cancer patients. Clin Nutr. 2017;36:11-48. Doi: 10.1016/j.clnu.2016.07.015. PMID: 27637832.

17. Instituto Nacional de Câncer José Alencar Gomes da Silva. Inquérito brasileiro de nutrição oncológica. Rio de Janeiro: INCA; 2013.

18. Aquino RC, Philippi ST. Desenvolvimento e avaliação de instrumentos de triagem nutricional. Rev. bras. enferm. 2012;65(4):607-613. Doi: 10.1590/S0034-71672012000400009.

19. Bezerra JD, Dantas MAM. Aplicação de instrumentos de triagem nutricional em hospital geral: um estudo comparativo. Revista Ciência & Saúde 2012;5(1):9-15. Doi: 10.15448/1983-652X.2012.1.9709

20. Calazans FDCF, Guandalini VR, Petarli GB, Moraes RAG, Cuzzuol JT, Cruz RP. Triagem Nutricional em Pacientes Cirúrgicos de um Hospital Universitário de Vitória, ES, Brasil. Nutr. clín. diet. hosp. 2015;35(3):34-41. Doi: 10.12873/353docarmo

21. Nunes PP, Marshall, NG. Triagem nutricional como instrumento preditor de desfechos clínicos em pacientes cirúrgicos. Com. Ciências Saúde. 2014;25(1):57-68.

22. Schiesser M, Müller S, Kirchhoff P, Breitenstein S, Schäfer M, Clavien PA. Assessment of a novel screening score for nutritional risk in predicting complications in gastro-intestinal surgery. Clin Nutr. 2008 Aug;27(4):565-70. Doi: 10.1016/j.clnu.2008.01.010. PMID: 18342995.

23. Santos IM, Mendes L, Carolino E, Santos CA. Nutritional Status, Functional Status, and Quality of Life - What is the Impact and Relationship on Cancer Patients? Nutr Cancer. 2020 Oct 29:1-14. Doi: 10.1080/01635581.2020.1839520. PMID: 33121266.

24. Lotici T, Antunes LBBA, Melhem ARF, Bennemann GD, Schiessel DL. Prevalência de perda de peso, caquexia e desnutrição, em pacientes oncológicos. Revista UniAbeu. 2014;17 (7):107-124.

25. Cid Conde L, Fernández López T, Neira Blanco P, Arias Delgado J, Varela Correa JJ, Gómez Lorenzo FF. Prevalencia de desnutrición en pacientes con neoplasia digestiva previa cirugía. Nutr Hosp. 2008 Jan-Feb;23(1):46-53.

26. Pañella L, Jara M, Cornejo M, Lastra X, Contreras MG, Alfaro K et al. Relación entre estado nutricional y evolución postoperatoria, en cirugía oncológica digestiva. Rev. méd. Chile. 2014;142(11):1398-1406. Doi: 10.4067/S0034-98872014001100006.

27. Rodrigues HHNP, Palauro ML, Behne TEG, Sierra JC, Andreo FO, Thé MBS, Aguilar-Nascimento JE de, Dock-Nascimento DB. Risco Nutricional versus Risco de Sarcopenia Associado a Complicações Pós-Operatórias e Mortalidade em Pacientes Oncológicos Submetidos a Cirurgias de Grande Porte. Rev. Bras. Cancerol.. 2021;67(1):e151201. Doi: 10.32635/2176-9745.RBC.2021v67n1.1201

28. Kehlet H. Postoperative pain, analgesia, and recovery-bedfellows that cannot be ignored. Pain. 2018; 159(9): S11-S16. Doi: 10.1097/j.pain.0000000000001243. PMID: 30113942.

29. Dou L, Wang X, Cao Y, Hu A, Li L. Relationship between Postoperative Recovery and Nutrition Risk Screened by NRS 2002 and Nutrition Support Status in Patients with Gastrointestinal Cancer. Nutr Cancer. 2020;72(1):33-40. Doi: 10.1080/01635581.2019.1612927. PMID: 31079488.

30. Burden ST, Hill J, Shaffer JL, Todd C. Nutritional status of preoperative colorectal cancer patients. J Hum Nutr Diet. 2010;23(4):402-7. Doi: 10.1111/j.1365-277X.2010.01070.x. PMID: 20487172.

31. de-Aguilar-Nascimento JE, Salomão AB, Waitzberg DL, et al. Diretriz ACERTO de intervenções nutricionais no perioperatório em cirurgia geral eletiva. Rev Col Bras Cir. 2017;44(6):633-48. Doi: 10.1590/0100-69912017006003.

Contributors

All authors contributed to the conception and/or planning of the study, the collection, analysis and interpretation of the data, writing and critical review of the manuscript and approved the final version to be published.

Conflict of interest: The authors declare no conflicts of interest.

.

Received: January 22, 2022
Accepted: June 27, 2022