



Original Article

Factors affecting the assessment of cancer cachexia by nurses caring for patients with advanced cancer undergoing chemotherapy: A cross-sectional survey



Rika Sato^{a,b}, Naoko Hayashi^{a,*}, Naoko Nakayama^c, Aiko Okimura^a

^a Graduate School of Nursing Science, St Luke's International University, Tokyo, Japan

^b Division of Nursing, Shizuoka Cancer Center, Shizuoka, Japan

^c Kanagawa University of Human Services, Kanagawa, Japan

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ABSTRACT

Objective: This study aimed to identify the awareness, knowledge, and assessment of cancer cachexia among nurses who cared for patients with advanced cancer undergoing chemotherapy. In addition, we identified the factors that affected their assessments.

Methods: A cross-sectional survey was conducted among nurses who cared for patients with advanced cancer undergoing chemotherapy at designated cancer care hospitals and regional cancer care cooperation hospitals between June and September 2020. We applied Bandura's triadic reciprocal causation as the research framework. The questionnaire consisted of questions on awareness, knowledge, and assessment of cancer cachexia. Single and multiple regression analyses were conducted on the relationship between each variable and the number of assessment items.

Results: Questionnaires were sent to 1026 nurses, 403 of whom responded (response rate: 39.3%). Among these, 299 responses were valid, being a 74.1% valid response rate. The average age was 39.74 ± 9.65 years and the mean work experience as a nurse was 16.50 ± 9.14 years. In respect of the awareness of cancer cachexia, 93.3% of the participants answered "assessment of cancer cachexia was needed," and 75.2% answered "a nurse's role includes assessing for cancer cachexia." Only 15.4% responded positively regarding "confidence in the assessment of cancer cachexia." Regarding knowledge of cancer cachexia, the percentage of correct answers to questions about the definition of cachexia and diagnostic criteria ranged from 45.5% to 53.8%. With regard to cancer cachexia assessments, the participants assessed "weight loss or rate of weight loss (56.9%)," "symptoms affecting nutritional status (54.2%)," and "anorexia (46.2%)." Factors affecting the assessment of cancer cachexia were higher knowledge scores on cancer cachexia ($P = 0.039$), routine assessment of cancer cachexia ($P < 0.001$), experiences of participating in in-hospital training on cancer cachexia ($P = 0.027$), and collaborating with physical/occupational therapists in the nutritional management of patients ($P = 0.025$).

Conclusions: Nurses held the view that their role required them to assess for cancer cachexia, but they did not feel confident in doing so. In addition, they lacked knowledge of reversible "cancer cachexia;" hence, the assessments were not routinely completed. Education on these topics and the development and standardization of tools to assess or collaborate with other professions are required.

Introduction

Among people with advanced cancer, 50%–80% present cancer cachexia. The incidence varies by carcinoma but is particularly high in patients with pancreatic, stomach, and esophageal cancers.^{1–5} Weight loss affects the survival period, and for patients with cancer cachexia,

weight loss reduces overall survival, increases chemotherapy toxicity, reduces quality of life, and leads to longer hospital stays and higher health care costs.^{6–12} In 2011, the European Palliative Care Research Collaborative (EPCRC) defined cancer cachexia as "a multifactorial syndrome characterized by an ongoing loss of skeletal muscle mass (with or without loss of fat mass) that cannot be fully reversed by conventional

* Corresponding author.

E-mail address: naoko-hayashi@slcn.ac.jp (N. Hayashi).

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nutritional support and leads to progressive functional impairment.”⁶ They classified cancer cachexia into three stages: pre-cachexia, cachexia, and refractory cachexia.⁶ The pre-cachexia and cachexia stages are reversible, and multidisciplinary approaches that include pharmacotherapy, nutrition, exercise, or psychosocial therapy may be effective. The condition may not be reversible in the refractory cachexia phase, but it is possible to improve the quality of life and control nutritional impact symptoms (NIS). As patients and their families experience eating-related distress and weight-related distress, psychosocial interventions, such as informing them about cancer cachexia, are required.^{13–16} Therefore, the focus of cancer cachexia research and treatment has shifted to the condition's early stages.^{5,6,17} Cancer cachexia differs from starvation, the gradual loss of both fat and muscle mass due to decreased food intake, and sarcopenia, associated with aging.^{6,7,18,19} A comprehensive assessment of all the metabolic changes, anorexia, nutrition impact symptoms, physical function, and the psychosocial effects is therefore desirable.^{6,20} However, among the various symptoms presented in patients with advanced cancer, cancer cachexia has been poorly conceptualized, lacks evidence for its treatment, and is rarely recognized, evaluated, and managed by healthcare professionals.^{8,9,10,21–23} In particular, the current status of nurses' awareness, knowledge, and assessment of cancer cachexia is unclear. Hence, this study aimed to identify the awareness, knowledge, and assessment of cancer cachexia among nurses who cared for patients with advanced cancer undergoing chemotherapy. In addition, we identified the factors that affected the assessment of cancer cachexia.

Methods

Study design

This cross-sectional study used a self-administered web-based questionnaire. Ethical approval had been obtained from the Institutional Review Board of St. Luke's International University, Japan (Approval No. 20-A021). Before the questionnaire was distributed, we asked for consent via the Internet, and only those who agreed to participate were furnished with the questionnaire. In addition, after the questionnaire was completed, the participants were informed that they could not withdraw their answers once they were sent; their intention to participate was then re-confirmed. This study was conducted in accordance with the principles set by the Declaration of Helsinki, as amended.

Framework of the study

Bandura's triadic reciprocal causation was applied as the framework for this study (Fig. 1). The determinants of human behavior were not unidirectional; however, the three factors of behavior (B), internal personal factors (P), and the external environment (E) influenced each other.^{11,12,24} In this study, the factors that affected the assessment of cancer cachexia (B) were the nurse's demographics, awareness, and knowledge of cancer cachexia (P), and their institutional demographics (E). For this study, the term “assessment” denotes screening and monitoring cancer cachexia.

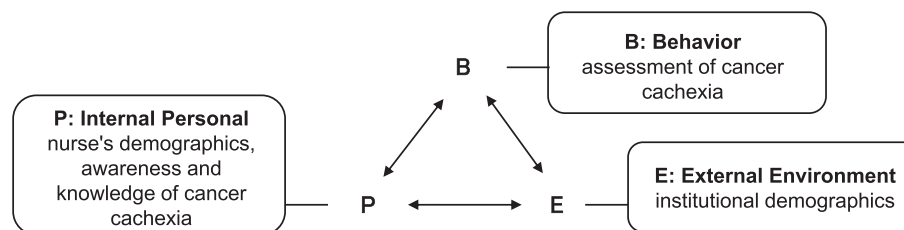


Fig. 1. Framework of the factors affecting the assessment of cancer cachexia based on triadic reciprocal causation. In this model, three factors of behavior (B), internal personal factors (P), and the external environment (E) operated interactively as determinants of each other.²⁴

Participants

The data collection period was from June to September 2020. The inclusion criteria were nurses who (1) belonged to designated cancer care hospitals and regional cancer care cooperation hospitals in Japan, (2) worked in the wards or outpatient departments of respiratory or gastroenterology and outpatient treatment centers, and (3) were involved in the care of patients with advanced cancer who underwent chemotherapy. Managers (eg, head nurses) who were not directly involved in patient care were excluded from the study.

Measurements

Characteristics of the participants and their institution

The following characteristics of the nurses were ascertained by means of a questionnaire: their age, work experience as a nurse with patients who underwent chemotherapy, education, licenses, number of cases where cancer cachexia had been assessed in the previous month, participation in training on cancer cachexia, teams or specialists in the hospital, and collaboration with other professionals in the nutritional management of patients. We categorized some professionals in this survey as “others” because many occupations are involved in managing patient nutrition.

Awareness

As there was no validated scale for this study, we developed a questionnaire that enquired about nurses' awareness of cancer cachexia. Based on Bandura's Social Cognitive Theory,^{24,25} we developed three items to be measured: “assessment of cancer cachexia was needed,” “confidence in assessing cancer cachexia,” and “a nurse's role includes assessing for cancer cachexia.” Responses to each item were scored as follows: 1 point for “strongly agree,” 2 points for “agree,” 3 points for “disagree,” and 4 points for “strongly disagree.”

Knowledge

We also ascertained nurses' knowledge of cancer cachexia. Based on a literature review,^{6,11,18,26–29} we developed eight items regarding the definition, classification, pathogenesis, and symptoms of cancer cachexia. Regarding definitions, we used the EPCRC's definitions^{6,30,31} for the items “Cancer cachexia can be reversed only with nutrition counseling” and “Cancer cachexia is characterized by persistent loss of skeletal muscle mass.” For the tendency to view cancer cachexia as a terminal condition,²³ we referred to Fearon's classification⁶ for the items “Cancer cachexia refers to both reversible and irreversible conditions” and “Unintentional weight loss of > 5% in the past six months may indicate cancer cachexia.” Regarding the pathogenesis of cancer cachexia,²⁷ we created the items “Cancer cachexia results from the patient's host and also from systemic inflammation of the tumor” and “Cancer cachexia-related weight loss and starvation-related weight loss have the same mechanism.” Regarding the NIS,^{29,32,33} we created the items “Weight loss can be due not only to adverse events of the chemotherapy but also gastrointestinal symptoms caused by cancer cachexia.” As cancer cachexia has been reported to cause weight-related distress and eating-related distress,^{15,16} we created an item with reference to the

Functional Assessment of Anorexia/Cachexia Treatment and European Organization for Research and Treatment of Cancer Quality of Life Questionnaire (EORTC QOL) Module for Cancer Cachexia (QLQ-CAX24),^{34,35} “Patients with cancer cachexia have eating-related distress and conflicts with caregivers regarding food.” Nurses were asked to respond to each of these items with “correct,” “incorrect,” or “I do not know.” We scored “incorrect” and “I do not know” as 0 points and “correct” as 1 point. The total scores ranged from 0 to 8. Higher scores indicated that the nurse had more knowledge about cancer cachexia.

Assessment

We enquired about nurses' assessment of cancer cachexia. We developed the items regarding cancer cachexia assessment based on topics listed in the EPCRC's consensus (anorexia or reduced food intake, catabolic drivers, muscle mass and strength, functional and psychosocial effects).⁶ The assessment tools currently used to assess cancer cachexia were also included. The Patient-Generated Subjective Global Assessment's items on weight change, food intake, symptoms, activity, and function,³⁴ the Functional Assessment of Anorexia/Cachexia Treatment items on anorexia and early satiety, nausea, and taste or olfactory abnormalities,³⁵ and the psychological items of the EORTC QLQ-C30 and QLQ-CAX24³⁶ were also covered. Eleven items related to cancer cachexia assessment were presented, and the participants were asked to check the ones they thought were appropriate as cancer cachexia assessment items. For each question, we obtained responses for “assessment as part of daily patient care,” “assessment regarding cancer cachexia,” and “no assessment.”

To ensure content validity, the questionnaire was first administered to a panel of cancer cachexia experts: one medical oncologist, one respiratory physician, one gastroenterologist, five oncology nurse specialists, one nurse who belonged to the Nutrition Support Team (NST), and one dietician. The results were used to make additions and corrections to the final version.

Data collection and data analysis

The minimum sample size is calculated as five times the number of items asked. In this study, the questionnaire had 36 items; hence, at least 180 participants were needed for the analyses. We estimated that the cooperation rate among the nursing directors would be approximately 25%, and response rate from the participants would be approximately 25%. In this study, we estimated that 180 designated cancer care hospitals and regional cancer care cooperative hospitals would participate. We randomly selected 180 of the 447 facilities and requested their participation. Data were analyzed using descriptive statistics. The factors predicted to be related to the assessment of cancer cachexia from previous studies were used as independent variables. Furthermore, the number of cancer cachexia assessment items that corresponded with “assessed regarding cancer cachexia” were used as dependent variables. Simple and multiple regression analyses were conducted, and IBM's SPSS version 24.0 was used to analyze the data. All significance levels were set at 5% (two-tailed).

Results

The questionnaires were sent to 1026 people and 403 responded (response rate: 39.3%). Of those, 299 responses were valid (valid response rate: 74.1%). The nurses' demographics are presented in Table 1. The average age was 39.74 ± 9.65 years, and the mean work experience as a nurse and with patients who underwent chemotherapy was 16.50 ± 9.14 years and 4.00 ± 1.67 years, respectively.

Cancer cachexia awareness, knowledge, and assessment

Regarding the awareness of cancer cachexia, 93.3% of the participants answered “strongly agree” or “agree” to the question whether

Table 1
Characteristics of the nurses (n = 299).

Characteristics	n (%)
Age (years, mean ± SD)	39.74 ± 9.65
Working experience as a nurse (years, mean ± SD)	16.50 ± 9.14
Working experience with patients undergoing chemotherapy (years, mean ± SD)	4.00 ± 1.67
Education	
High school graduate	5 (1.7)
Diploma	181 (60.5)
Associate	34 (11.4)
Bachelor	67 (22.4)
Master or above	12 (4.0)
License	
Certified nurse	53 (17.7)
Certified nurse specialist	8 (2.7)
Certification in nutrition management	5 (1.7)
None	233 (77.9)
Number of cases in cancer cachexia assessment in the past month	
0	130 (43.5)
1–5	87 (29.1)
5–10	27 (9.0)
10–20	8 (2.7)
> 20	10 (3.3)
Do not know	37 (12.4)
Experiences of participating in training on cancer cachexia	
Pre-registration	65 (21.7)
Graduate school	4 (1.3)
Others	24 (8.0)
In-hospital	81 (27.1)
Out-of-hospital	46 (15.4)
Nothing	137 (45.8)
Teams or specialists in the hospital	
Palliative care team	296 (99.0)
Nutrition support team	292 (97.7)
Certified nurse	143 (47.8)
Certified nurse specialist	238 (79.6)
NST member	161 (53.8)
Collaborating with other professionals in the nutritional management of patients	
Doctor	263 (67.9)
Dietician	179 (59.9)
Pharmacist	128 (42.8)
Physical therapist/occupational therapist	66 (22.1)
Others	87 (29.1)

“assessment of cancer cachexia was needed,” and 75.2% answered positively to the item “a nurse's role includes assessing for cancer cachexia.” Only 15.4% responded with “strongly agree” or “agree” to the “confidence in the assessment of cancer cachexia” item (Table 2).

The median score for knowledge of cancer cachexia was 6 out of 8 points. The percentages of correct answers to the questions regarding the definition and diagnostic criteria of cancer cachexia, which included “characterized by persistent loss of skeletal muscle mass,” “refers to both reversible and irreversible conditions,” and “unintentional weight loss of > 5% in the past six months,” were 45.5%, 53.8%, and 50.5%, respectively (Table 3).

Table 2
Awareness of cancer cachexia (n = 299).

	Strongly agree n (%)	Agree n (%)	Disagree n (%)	Strongly disagree n (%)
The assessment of cancer cachexia was needed	136 (45.5)	143 (47.8)	16 (5.4)	4 (1.3)
Confidence in the assessment of cancer cachexia	1 (0.3)	45 (15.1)	157 (52.5)	96 (32.1)
A nurse's role includes assessing for cancer cachexia	33 (11.0)	192 (64.2)	70 (23.4)	4 (1.3)

Table 3
Knowledge of cancer cachexia (n = 299).

	Correct n (%)	Incorrect n (%)	I don't know n (%)
Cancer cachexia can be reversed only with nutrition counseling	1 (0.3)	261 (87.3)	37 (12.4)
Cancer cachexia is characterized by the persistent loss of skeletal muscle mass	136 (45.5)	27 (9.0)	136 (45.5)
Cancer cachexia refers to both reversible and irreversible conditions	161 (53.8)	28 (9.4)	110 (36.8)
Unintentional weight loss of > 5% in the past six months may indicate cancer cachexia	151 (50.5)	25 (8.4)	123 (41.1)
Cancer cachexia results from the patient's host and also from systemic inflammation of the tumor	235 (78.6)	6 (2.0)	58 (19.4)
Cancer cachexia-related weight loss and starvation-related weight loss have the same mechanism	7 (2.3)	200 (66.9)	92 (30.8)
Weight loss can be due not only adverse events of the chemotherapy but also gastrointestinal symptoms caused by cancer cachexia	246 (82.3)	6 (2.0)	47 (15.7)
Patients with cancer cachexia have eating-related distress and conflicts with caregivers regarding food	257 (86.0)	2 (0.7)	40 (13.4)

Bold is the correct answer.

Concerning the 11 assessment items, the median number of items that participants chose as related to “assessment as part of daily patient care” and “assessment regarding cancer cachexia” was six and four, respectively. The highest response percentages for “assessment regarding cancer cachexia” were for the items “weight loss or rate of weight loss (56.9%),” “symptoms affecting nutritional status (54.2%),” and “anorexia (46.2%)” (Table 4).

Factors related with nurses' assessment of cancer cachexia

The results of the single regression analysis regarding the factors affecting the assessment of cancer cachexia are shown in Table 5. The

Table 4
Assessment of cancer cachexia (n = 299).

	No assessment n (%)	Assessment as part of daily patient care n (%)	Assessment regarding cancer cachexia n (%)
Anorexia	1 (0.3)	160 (53.5)	138 (46.2)
Food intake	2 (0.7)	171 (57.2)	126 (42.1)
Symptoms affecting nutritional status (nausea, vomiting, constipation, diarrhea, mouth ulcers, etc.)	2 (0.7)	135 (45.2)	162 (54.2)
Distress related with anorexia	9 (3.0)	167 (55.9)	123 (41.1)
Caregiver distress related with patient's anorexia	40 (13.4)	189 (63.2)	70 (23.4)
Physical functioning	25 (8.4)	150 (50.2)	124 (41.5)
Weight loss or rate of weight loss	9 (3.0)	120 (40.1)	170 (56.9)
BMI (body mass index)	89 (29.8)	143 (47.8)	67 (22.4)
Muscle strength	140 (46.8)	127 (42.5)	32 (10.7)
Inflammatory response	14 (4.7)	151 (50.5)	134 (44.8)
Muscle mass	144 (48.2)	115 (38.5)	40 (13.4)

Table 5
Factors related with the nurses' assessment of cancer cachexia (n = 299).

Variable	Univariate regression analysis			Multivariate regression analysis		
	B	β	P	B	β	P
Age	0.039	0.115	0.047			
Working experience as a nurse	0.036	0.102	0.079	0.051	0.114	0.005
Assessment of cancer cachexia was needed	1.572	0.121	0.036	0.112	0.009	0.871
Confidence in assessment of cancer cachexia	1.504	0.167	0.004	0.225	0.025	0.630
Assessment of cancer cachexia was the nurses' role	0.889	0.118	0.041	0.023	0.003	0.954
Knowledge of cancer cachexia	0.398	0.257	< 0.001	0.175	0.113	0.039
Assessed for cancer cachexia in the past month	3.071	0.469	< 0.001	2.559	0.391	< 0.001
Experience of participating in in-hospital training on cancer cachexia	1.807	0.247	< 0.001	0.849	0.116	0.027
Experience of participating in out-of-hospital training on cancer cachexia	1.607	0.179	0.002			
Collaborating with a dietitian on nutritional management	0.835	0.126	0.029	0.322	0.049	0.356
Collaborating with a physical therapist/occupational therapist on nutritional management	1.404	0.179	0.002	0.946	0.121	0.025
Working with a certified nurse specialist	0.654	0.101	0.082	0.440	0.068	0.182
Adjusted R ²					0.272	
F					12.115	
P					< 0.001	

results of the multiple regression analysis regarding the factors affecting cancer cachexia assessment were higher knowledge scores on cancer cachexia (P = 0.039), routine assessment of cancer cachexia (P < 0.001), experiences of participating in in-hospital training on cancer cachexia (P = 0.027), and collaborating with physical/occupational therapists in the nutritional management of patients (P = 0.025) (Table 5).

Discussion

This study revealed that nurses lacked confidence in assessing cancer cachexia. The results were similar to those of previous studies in which a low percentage of nurses were confident in making nutritional assessments of patients with cancer.³⁷ Bandura stated that expectations were an antecedent of behavior and included “efficacy beliefs” (the ability to successfully perform an appropriate action) and “outcome expectancies” (the consequences caused by a certain action).²⁵ In this study, confidence in the assessment of cancer cachexia was defined as what Bandura called “efficacy beliefs.” These beliefs can vary based on the individual's “previous mastery experiences,” denoting that individuals were able to act and accomplish the required behavior on their own; “vicarious experience,” which indicates that those

individuals felt like they could accomplish the task; “social persuasion,” which are encouragement from others that one has the ability to master the behavior; and “emotional arousal,” which are the physiological responses to the action.²⁵ Among them, “previous mastery experiences” especially have the strongest impact for “efficacy beliefs.”²⁵ However, nurses may not have many opportunities to receive “previous mastery experiences” regarding the assessment of cancer cachexia. The lack of opportunities may be due to the complications of cancer cachexia. The condition should be comprehensively assessed; however, doing so is difficult because of a lack of standardized tools and limited human resources.^{21,23,38} Research on clinically usable and effective methods is being conducted currently.^{39–41}

The difficulty may also arise because many healthcare providers have realized that the nutritional management in patients with cancer is important, but few nurses understand the etiology and management of cancer cachexia and its unfavorable effects.²³ Furthermore, the condition has not been actively assessed to date.^{8,19–21,42,43} In particular, it had been found that oncology nurses were less aware of the guidelines and received less relevant nutritional training than physicians and dietitians.^{21,44} The “Putting Evidence into Practice” resource widely used in oncology nursing does not include cachexia, but instead describes it as anorexia, and there are fewer evidence-based interventions than other symptom management techniques.⁴⁵ There are few nurse-led studies for cancer cachexia, and nurses rarely learn about cancer cachexia in pre-graduate education.^{23,38} Studies have reported that even oncology nurses may not be fully aware of the prevalence of early stage cancer cachexia, which is reversible.^{2,46} This is consistent with this study’s results, which showed that nurses may not have the knowledge of the reversible “cachexia” defined by the EPCRC, such as skeletal muscle mass loss and rate of weight loss. Healthcare professionals are aware from experience that weight loss is a symptom of cancer cachexia. However, studies have reported that it is difficult to distinguish between weight loss related to cancer cachexia and just transitory weight loss.¹⁹ In this study, nurses routinely assessed items specific to cancer cachexia but often did not assess them as symptoms of cancer cachexia. Nurses are the major healthcare workforce in terms of numbers, and their knowledge needs to be expanded significantly.

These situations may lead to missed opportunities for the detection of and intervention for patients with pre-cachexia or cachexia. Bapuji also suggests that knowledge of weight loss is essential to improve nurses’ assessment skills.⁴⁷ It is necessary to increase their “previous mastery experiences,” such as providing educational opportunities and developing content in the assessment of cancer cachexia. Affective learning may be helpful when we consider “previous mastery experiences” or “emotional arousal” as it relates to how learners feel during learning as well as how learning experiences are internalized and can guide learners’ attitudes, opinions, and behaviors in the future.⁴⁸ It is possible to consider how learners’ emotions and learning experiences shape their learning.

In addition, sharing information with dietitians and physical/occupational therapists on a regular basis was found to influence nurses’ assessment of cancer cachexia. Bandura stated that one gains an enormous amount of information from what others express regarding the rules of one’s own behavior and how to act in a controlled and efficient manner.²⁵ The nurses who collaborated with other professionals on the nutritional management of patients were assumed to be able to recognize the necessity of a comprehensive assessment, such as the metabolic changes caused by the tumor and host, anorexia, NIS, and psychosocial effects. As shown by Bandura’s triadic reciprocal causation, E (External Environment) as well as P (Internal Personal) were supposed to facilitate nurses’ assessment of cancer cachexia. In the external environment, Granda-Cameron and Lynch stated that nursing administration, nursing research, and nursing education also impact nursing practice in cancer cachexia.⁴⁹ Intervention is necessary not only among individual nurses but also in their surrounding environment, such as staffing, time management for assessment, and the development of more concise and

standardized assessment tools. Previous studies have shown that a multidisciplinary team approach may have a positive effect on weight and quality of life among patients with cancer cachexia.^{50–53} For example, a physician-led multidisciplinary team enhanced the quality of nutritional care as they assessed the nutritional status and intervened for patients with cancer and with cachexia.⁵⁴ A multidisciplinary approach focuses on self-management and behavior change of the patient. Delivering any one intervention, such as nutrition or exercise, without attention to other important key elements of the cancer cachexia syndrome, may prevent adherence to that intervention or wash out potential effects.^{52,55} Assessment in a multidisciplinary approach would reveal the needs of patients and caregivers regarding cancer cachexia and lead to education and management that would allow them to continue with the intervention.⁵⁶ The assessment of cancer cachexia is important as it leads to not only interventions such as nutrition and exercise but also personalized educational interventions for patients and caregivers. The nurse is an essential part of the multidisciplinary team that assesses cancer cachexia and intervenes with them.

Limitations

This study has several limitations. First, our participants were nurses at designated cancer center care hospitals and regional cancer care cooperation hospitals, who do not represent the entire population of Japanese nurses engaged in cancer treatment. Instead, they actually might have a higher awareness and knowledge of cancer nursing than other nurses. Second, although the content validity of the questionnaire used was ensured by the expert panel, further verification of its reliability and validity is required in the future.

Nursing implications

Opportunities to learn about cancer cachexia are rare in pre- and post-graduate nursing education; it is necessary to provide opportunities and develop content to help them learn about cancer cachexia. Nurses’ awareness and knowledge of cancer cachexia should be increased so that they are able to make assessments. It is also important to educate individual nurses and address their environmental factors, such as nursing administration, nursing research, and nursing education. Information sharing with dietitians and physical and occupational therapists had an impact on the assessment of cancer cachexia. Therefore, it is necessary to develop standardized tools to facilitate these processes, foster an organizational culture that encourages collaboration among other professions, and consider staffing at the same time.

Conclusions

In our study, nurses considered the assessment of cancer cachexia as part of their role, but they lacked confidence in their ability to do so. In addition, they had limited knowledge of reversible cancer cachexia, and the condition was not routinely assessed. Education on these topics and the development and standardization of tools to assess or collaborate with other professionals are necessary.

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Authors’ contributions

Conceived and designed the analysis: Rika Sato, Naoko Hayashi. Collected the data: Rika Sato. Contributed data or analysis tools: Rika Sato, Naoko Hayashi, Naoko Nakayama, Aiko Okimura. Performed the analysis: Rika Sato. Wrote the paper: Rika Sato, Naoko Hayashi.

Declaration of competing interest

None declared.

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Ethics statement

This study was approved by the Institutional Review Board of St. Luke's International University, Japan (Approval No. 20-A021).

References

- Argilés JM, Busquets S, Stemmler B, López-Soriano FJ. Cancer cachexia: understanding the molecular basis. *Nat Rev Cancer*. 2014;14(11):754–762. <https://doi.org/10.1038/nrc3829>.
- Sun L, Quan XQ, Yu S. An epidemiological survey of cachexia in advanced cancer patients and analysis on its diagnostic and treatment status. *Nutr Cancer*. 2015;67(7):1056–1062. <https://doi.org/10.1080/01635581.2015.1073753>.
- von Haehling S, Anker SD. Cachexia as a major underestimated and unmet medical need: facts and numbers. *J Cachexia Sarcopenia Muscle*. 2010;1(1):1–5. <https://doi.org/10.1007/s13539-010-0002-6>.
- Fox KM, Brooks JM, Gandra SR, Markus R, Chiou CF. Estimation of cachexia among cancer patients based on four definitions. *JAMA Oncol*. 2009;2009:693458. <https://doi.org/10.1155/2009/693458>.
- Bozzetti F. Nutritional support of the oncology patient. *Crit Rev Oncol Hematol*. 2013;87(2):172–200. <https://doi.org/10.1016/j.critrevonc.2013.03.006>.
- Fearon K, Strasser F, Anker SD, et al. Definition and classification of cancer cachexia: an international consensus. *Lancet Oncol*. 2011;12(5):489–495. [https://doi.org/10.1016/S1470-2045\(10\)70218-7](https://doi.org/10.1016/S1470-2045(10)70218-7).
- Dewys WD, Begg C, Lavin PT, et al. Prognostic effect of weight loss prior to chemotherapy in cancer patients. Eastern Cooperative Oncology Group. *Am J Med*. 1980;69(4):491–497. [https://doi.org/10.1016/S0149-2918\(05\)80001-3](https://doi.org/10.1016/S0149-2918(05)80001-3).
- Ross PJ, Ashley S, Norton A, et al. Do patients with weight loss have a worse outcome when undergoing chemotherapy for lung cancers? *Br J Cancer*. 2004;90:1905–1911. <https://doi.org/10.1038/sj.bjc.6601781>.
- Antoun S, Baracos VE, Birdsall L, Escudier B, Sawyer MB. Low body mass index and sarcopenia associated with dose-limiting toxicity of sorafenib in patients with renal cell carcinoma. *Ann Oncol*. 2010;21:1594–1598. <https://doi.org/10.1093/annonc/mdp605>.
- Hopkinson JB. Psychosocial impact of cancer cachexia. *J Cachexia Sarcopenia Muscle*. 2014;5:89–94. <https://doi.org/10.1007/s13539-014-0142-1>.
- Wheelwright S, Darlington AS, Hopkinson JB, Fitzsimmons D, Johnson C. A systematic review and thematic synthesis of quality of life in the informal carers of cancer patients with cachexia. *Palliat Med*. 2016;30(2):149–160. <https://doi.org/10.1177/0269216315588743>.
- Arthur ST, Noone JM, Van Doren BA, Roy D, Blanchette CM. One-year prevalence, comorbidities and cost of cachexia-related inpatient admissions in the USA. *Drugs Context*. 2014;3:212265. <https://doi.org/10.7573/dic.212265>.
- Amano K, Maeda I, Morita T, et al. Eating-related distress and need for nutritional support of families of advanced cancer patients: a nationwide survey of bereaved family members. *J Cachexia Sarcopenia Muscle*. 2016;7(5):527–534. <https://doi.org/10.1002/jcsm.12102>.
- Amano K, Maeda I, Morita T, et al. Need for nutritional support, eating-related distress and experience of terminally ill patients with cancer: a survey in an inpatient hospice. *BMJ Support Palliat Care*. 2016;6(3):373–376. <https://doi.org/10.1136/bmjspcare-2014-000783>.
- Strasser F, Binswanger J, Cerny T, Kesselring A. Fighting a losing battle: eating-related distress of men with advanced cancer and their female partners. A mixed-methods study. *Palliat Med*. 2007;21(2):129–137. <https://doi.org/10.1177/0269216307076346>.
- Amano K, Baracos VE, Hopkinson JB. Integration of palliative, supportive, and nutritional care to alleviate eating-related distress among advanced cancer patients with cachexia and their family members. *Crit Rev Oncol Hematol*. 2019;143:117–123. <https://doi.org/10.1016/j.critrevonc.2019.08.006>.
- Fearon K, Arends J, Baracos V. Understanding the mechanisms and treatment options in cancer cachexia. *Nat Rev Clin Oncol*. 2013;10(2):90–99. <https://doi.org/10.1038/nrclinonc.2012.209>.
- Ter Beek L, Vanhauwaert E, Slinde F, et al. Unsatisfactory knowledge and use of terminology regarding malnutrition, starvation, cachexia and sarcopenia among dietitians. *Clin Nutr*. 2016;35(6):1450–1456. <https://doi.org/10.1016/j.clnu.2016.03.023>.
- Kiss N, Bauer J, Boltong A, et al. Awareness, perceptions and practices regarding cancer-related malnutrition and sarcopenia: a survey of cancer clinicians. *Support Care Cancer*. 2020;28(11):5263–5270. <https://doi.org/10.1007/s00520-020-05371-7>.
- Arends J, Strasser F, Gonella S, et al. Cancer cachexia in adult patients: ESMO clinical practice guidelines. *ESMO Open*. 2021;6(3):100092. <https://doi.org/10.1016/j.esmoop.2021.100092>.
- Churm D, Andrew IM, Holden K, Hildreth AJ, Hawkins C. A questionnaire study of the approach to the anorexia-cachexia syndrome in patients with cancer by staff in a district general hospital. *Support Care Cancer*. 2009;17(5):503–507. <https://doi.org/10.1007/s00520-008-0486-1>.
- Solheim TS, Laird BJ. Evidence base for multimodal therapy in cachexia. *Curr Opin Support Palliat Care*. 2012;6(4):424–431. <https://doi.org/10.1097/SPC.0b013e328328359b6668>.
- Sato R, Naito T, Hayashi N. Barriers in nursing practice in cancer cachexia: a scoping review. *Asia Pac J Oncol Nurs*. 2021;8(5):498–507. <https://doi.org/10.4103/apjon.2152>.
- Bandura A. *Social Foundations of Thought and Action: A Social Cognitive Theory*. Englewood Cliffs, N.J.: Prentice-Hall; 1986.
- Bandura A. *Self-efficacy: The Exercise of Control*. New York: W. H. Freeman; 1997.
- Amano K, Morita T, Koshimoto S, Uno T, Katayama H, Tataru R. Eating-related distress in advanced cancer patients with cachexia and family members: a survey in palliative and supportive care settings. *Support Care Cancer*. 2019;27(8):2869–2876. <https://doi.org/10.1007/s00520-018-4590-6>.
- Donohoe CL, Ryan AM, Reynolds JV. Cancer cachexia: mechanisms and clinical implications. *Gastroenterol Res Pract*. 2011;2011:601434. <https://doi.org/10.1155/2011/601434>.
- Oberholzer R, Hopkinson JB, Baumann K, et al. Psychosocial effects of cancer cachexia: a systematic literature search and qualitative analysis. *J Pain Symptom Manag*. 2013;46(1):77–95. <https://doi.org/10.1016/j.jpainsymman.2012.06.020>.
- Omlin A, Blum D, Wierecky J, Haile SR, Ottery FD, Strasser F. Nutrition impact symptoms in advanced cancer patients: frequency and specific interventions, a case-control study. *J Cachexia Sarcopenia Muscle*. 2013;4(1):55–61. <https://doi.org/10.1007/s13539-012-0099-x>.
- Evans WJ, Morley JE, Argilés J, et al. Cachexia: a new definition. *Clin Nutr*. 2008;27(6):793–799. <https://doi.org/10.1016/j.clnu.2008.06.013>.
- Fearon KC, Voss AC, Huestad DS, Cancer Cachexia Study Group. Definition of cancer cachexia: effect of weight loss, reduced food intake, and systemic inflammation on functional status and prognosis. *Am J Clin Nutr*. 2006;83(6):1345–1350. <https://doi.org/10.1093/ajcn/83.6.1345>.
- Kubrak C, Olson K, Baracos VE. The head and neck symptom checklist®: an instrument to evaluate nutrition impact symptoms effect on energy intake and weight loss. *Support Care Cancer*. 2013;21(11):3127–3136. <https://doi.org/10.1007/s00520-013-1870-z>.
- Ottery FD. Definition of standardized nutritional assessment and interventional pathways in oncology. *Nutrition*. 1996;12(1 suppl 1):S15–S19. [https://doi.org/10.1016/0899-9007\(96\)90011-8](https://doi.org/10.1016/0899-9007(96)90011-8).
- Ottery FD. Patient-generated subjective global assessment. In: McCallum PD, Polisen CG, eds. *The Clinical Guide to Oncology Nutrition*. Chicago: The American Dietetic Association; 2000:11–23.
- FACIT Group. Functional assessment of anorexia/cachexia treatment (version 4). <https://www.facit.org/measure/english-downloads/faact-english-downloads>; 2007. Accessed March 5, 2022.
- Wheelwright SJ, Hopkinson JB, Darlington AS, et al. Development of the EORTC QLQ-CAX24, a questionnaire for cancer patients with cachexia. *J Pain Symptom Manag*. 2017;53(2):232–242. <https://doi.org/10.1016/j.jpainsymman.2016.09.010>.
- Keaver L, Connolly P, Richmond J. Providing nutrition advice in the oncology setting: a survey of current practice, awareness of guidelines and training needs of Irish healthcare professionals in three hospitals. *Eur J Cancer Care*. 2021;30(4), e13405. <https://doi.org/10.1111/ecc.13405>.
- Zhao Y, Pang D, Lu Y. The role of nurse in the multidisciplinary management of cancer cachexia. *Asia Pac J Oncol Nurs*. 2021;8(5):487–497. <https://doi.org/10.4103/apjon.2123>.
- Blum D, Strasser F. Cachexia assessment tools. *Curr Opin Support Palliat Care*. 2011;5(4):350–355. <https://doi.org/10.1097/SPC.0b013e32834c4a05>.
- Argilés JM, Betancourt A, Guàrdia-Olmos J, et al. Validation of the Cachexia SCORE (CASCO). Staging cancer patients: the use of miniCASCO as a simplified tool. *Front Physiol*. 2017;8:92. <https://doi.org/10.3389/fphys.2017.00092>.
- Arribas L, Hurtós L, Sendrós MJ, et al. NUTRISCORE: a new nutritional screening tool for oncological outpatients. *Nutrition*. 2017;33:297–303. <https://doi.org/10.1016/j.nut.2016.07.015>.
- Millar C, Reid J, Porter S. Healthcare professionals' response to cachexia in advanced cancer: a qualitative study. *Oncol Nurs Forum*. 2013;40(6):E393–E402. <https://doi.org/10.1188/13.ONF.E393-E402>.
- Ferreira C, Camilo M, Pena R, Ravasco P. Undernutrition and nutritional supplements in oncology: what do health professionals and caregivers know? A pilot survey. *e-SPEN J*. 2012;7(1):46–49. <https://doi.org/10.1016/j.eclnm.2011.11.003>.
- Murphy JL, Munir F, Davey F, et al. The provision of nutritional advice and care for cancer patients: a UK national survey of healthcare professionals. *Support Care Cancer*. 2021;29(5):2435–2442. <https://doi.org/10.1007/s00520-020-05736-y>.
- Oncology Nursing Society. PEP topics. <https://www.ons.org/the-pep-topics>. Accessed 5 March 2022.
- Del Fabbro E, Jatoi A, Davis M, Fearon K, di Tomasso J, Vigano A. Health professionals' attitudes toward the detection and management of cancer-related anorexia-cachexia syndrome, and a proposal for standardized assessment. *J Community Support Oncol*. 2015;13(5):181–187. <https://doi.org/10.12788/jcso.0133>.
- Bapuji SB, Sawatzky JA. Understanding weight loss in patients with colorectal cancer: a human response to illness. *Oncol Nurs Forum*. 2010;37(3):303–310. <https://doi.org/10.1188/10.ONF.303-310>.
- Miller M. Teaching and learning in affective domain. In: Orey M, ed. *Emerging Perspectives on Learning, Teaching, and Technology*. CreateSpace; 2012:93–97.

49. Granda-Cameron C, Lynch MP. Clinical framework for quality improvement of cancer cachexia. *Asia Pac J Oncol Nurs*. 2018;5(4):369–376. https://doi.org/10.4103/apjon.apjon_18_18.
50. Solheim TS, Laird BJ, Balstad TR, et al. Cancer cachexia: rationale for the MENAC (multimodal-exercise, nutrition and anti-inflammatory medication for cachexia) trial. *BMJ Support Palliat Care*. 2018;8(3):258–265. <https://doi.org/10.1136/bmjspcare-2017-001440>.
51. Naito T, Mitsunaga S, Miura S, et al. Feasibility of early multimodal interventions for elderly patients with advanced pancreatic and non-small-cell lung cancer. *J Cachexia Sarcopenia Muscle*. 2019;10(1):73–83. <https://doi.org/10.1002/jcsm.12351>.
52. Parmar MP, Vanderbyl BL, Kanbalian M, Windholz TY, Tran AT, Jagoe RT. A multidisciplinary rehabilitation programme for cancer cachexia improves quality of life. *BMJ Support Palliat Care*. 2017;7(4):441–449. <https://doi.org/10.1136/bmjspcare-2017-001382>.
53. Chasen MR, Feldstain A, Gravelle D, Macdonald N, Pereira J. An interprofessional palliative care oncology rehabilitation program: effects on function and predictors of program completion. *Curr Oncol*. 2013;20(6):301–309. <https://doi.org/10.3747/co.20.1607>.
54. Senesse P, Isambert A, Janiszewski C, et al. Management of cancer cachexia and guidelines implementation in a comprehensive cancer center: a physician-led cancer nutrition program adapted to the practices of a country. *J Pain Symptom Manag*. 2017;54(3):387–393. <https://doi.org/10.1016/j.jpainsymman.2017.01.010>. e3.
55. Bland KA, Harrison M, Zopf EM, et al. Quality of life and symptom burden improve in patients attending a multidisciplinary clinical service for cancer cachexia: a retrospective observational review. *J Pain Symptom Manag*. 2021;62(3):e164–e176. <https://doi.org/10.1016/j.jpainsymman.2021.02.034>.
56. Vaughan VC, Harrison M, Dowd A, Eastman P, Martin P. Evaluation of a multidisciplinary cachexia and nutrition support service- the patient and carers perspective. *J Patient Exp*. 2021;8. <https://doi.org/10.1177/2374373520981476>, 2374373520981476.