The Cachexia Assessment Scale: Development and Psychometric Properties

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Purpose/Objectives: To develop a tool to identify patients with cancer who suffer from cachexia throughout all stages of the disease.

Design: Tool development study.

Setting: Oncology day care, follow-up clinics, radiotherapy, and hospice home care.

Sample: 90 patients with cancer (25 men and 65 women).

Methods: The Cachexia Assessment Scale (CAS) was created based on a thorough review of the literature and was tested for its psychometric properties.

Main Research Variables: Presence of cachexia.

Findings: Measures of reliability were determined by inter-rater, test-retest, and internal consistency reliability. Measures of validity were content validity, criterion validity, sensitivity, and specificity.

Conclusions: The CAS possesses adequate levels of reliability and validity and can be used to evaluate cachexia at all stages of cancer.

Implications for Nursing: The CAS can be used as an assessment tool for cachexia in various treatment settings.

Cachexia is defined as a syndrome characterized by the nondeliberate loss of more than 5% of body weight in the prior six months. Symptoms of cachexia include a decline in the amount of fat and muscle tissue, early satiety, loss of appetite, nausea, vomiting, dysphasia, and weight loss. A high frequency of cachexia has been found among patients with lung and head and neck tumors (Palesty & Dudrick, 2003). This syndrome is associated with several negative outcomes, including depression, poor survival, and lower quality of life (Brant, 1998; Costelli & Baccino, 2000; Dell, 2002; Inui, 2002).

Drastic weight loss is sometimes the first sign of disease. Some researchers have characterized weight loss and, therefore, cachexia as being directly responsible for the death of 30% of patients with cancer (Palesty & Dudrick, 2003). Nutritional disorders, in general, also have been shown to increase the morbidity of hospitalized patients (de Luis et al., 2006).

Cachexia normally is associated with patients at the terminal stage of disease and at the end of life (Bruera & Sweeney, 2000); however, since the late 1990s, an increased understanding about the development of cachexia has occurred. Cachexia has been found to be inseparable from the curative as well as palliative stages of treatment and care. In fact, it has been shown that the negative effects of weight loss can be treated with augmented nutrition combined with medication. Bruera and Sweeney (2000) found that patients with upper gastrointestinal cancer or intestinal obstruction who received high nutrition or oral supplements survived longer and had a better quality of life compared to patients who did not receive added nutrition. Therefore, the early identification of patients at risk for cachexia, particularly during the early stages of disease, can be an important treatment approach, leading to improved quality of life, outcomes, and even survival. According to Ottery, Bender, and Kasenic (2002), building a multidisciplinary, interventional, nutrition program at the time of diagnosis is imperative.

Although the literature stresses the need to assess cachexia, several authors have commented that no one tool exists that adequately measures cachexia among patients with cancer and no tool has been accepted as the gold standard (McCall & Cotton, 2001; Slaviero, Read, Clarke, & Rivory, 2003). The purpose of this study was to develop and test a new tool, the Cachexia Assessment Scale (CAS), to measure and assess cachexia among patients at all stages of cancer, including those in the early phases.

Methods

Sample

A convenience sample of patients with cancer in the community was recruited to participate in the study. Inclusion criteria were patients older than age 18 years who did not have a hematologic form of cancer and were not currently hospitalized. Sources of recruitment were a cancer follow-up clinic, oncology daycare clinic, radiotherapy clinic, and oncology homecare patients.

The study received institutional ethics approval and all subjects signed informed consent forms. The study was confidential and anonymous.

Instruments

The **CAS** is composed of three parts. The first part consists of patient demographic and clinical data (age, diagnosis, stage of cancer, and previous medical history). The second part contains 13 items relating to the assessment of cachexia. These items are divided into four categories: overall status (percentage of weight loss, functional status, and body mass index [BMI]), physical assessment (presence of stomatitis, edema, and ascites), laboratory findings (albumin, hemoglobin, and creatinine), and gastrointestinal system (dysphagia, loss of appetite, diarrhea, nausea, and vomiting) (see Figure 1). Each item was given a score from 0 (normal) to 4 (severe). The scores are based on those defined by the Common Terminology Criteria for Adverse Events (National Cancer Institute Cancer Therapy Evaluation Program, 2010).

The third part of the CAS serves as a summary of part two. The total number of items whose responses fall into levels 1–2 (mild to moderate) are calculated, as well as the total number of items whose responses fall into levels 3–4 (moderate to severe).

The level of cachexia is categorized based on the results of part three. A patient is categorized as not having cachexia if none of the responses are in the moderate-to-severe range (3–4) and up to one item is found in the mild-to-moderate level (1–2). Patients who have no severe symptoms, but mild-to-moderate symptoms on two or more items, are characterized as having mild cachexia. Moderate cachexia is defined as having severe symptoms on up to two items and all other items falling in the mild-to-moderate range. Finally, severe cachexia is defined as having three or more scores in the severe range.

The **Patient-Generated Subjective Global Assessment (PG-SGA)** is a nutrition tool for use in patients with cancer (Bauer, Capra, & Ferguson, 2002; Isenring, Bauer, & Capra, 2003). The PG-SGA contains two sections, a self-report questionnaire that includes items related to medical history, changes in weight and nutrition, gastrointestinal symptoms, and function status; and a physical examination section that is completed by a healthcare professional. The final score is a numerical sum of the two sections of the tool. Based on this total score, patients are divided into three categories: well-nourished, moderately malnourished or suspected malnutrition, or severely malnourished. The PG-SGA was used as the gold standard for this study. Its developers calculated the Cronbach-α internal consistency reliability to be 0.64 with a sensitivity of 98% and specificity of 82% when compared with the parent SGA study (Bauer et al., 2002).

Data Collection

Data collection was performed in three stages. The first stage consisted of determining the content validity of the CAS. This tool was sent to eight experts in oncology (two physicians, four nurses, and two dietitians). Reviewers were asked to compare the CAS to the PG-SGA related to content and ease of administration.

The second stage was a pilot study in which the first 25 participants were simultaneously evaluated by one of the researchers and another nurse. Informed consent was obtained. Height and weight and the physical assessment portion of the CAS and PG-SGA were collected by both data collectors independently. Laboratory data also were collected from the patients' charts. Data collection took approximately three to five minutes for the CAS and another 10 minutes for the PG-SGA.

After a review of the pilot study data, no major changes were made to the CAS and the final phase of the study began. Each patient was evaluated by one of the investigators at three points in time with a space of two weeks to one month between each data collection point. Several types of reliability and validity were measured including inter-rater, test-retest, and internal consistency reliability and content and criterion validity as well as sensitivity and specificity.

Statistical Analysis

Inter-rater reliability was determined using Pearson Product Moment Correlations between the simultaneous assessments of two data collectors. Test-retest reliability was determined using Pearson Product Moment Correlations between data collected at three points in time, with two to four weeks between each data collection point. Internal consistency reliability was determined using Cronbach-α. Content validity was determined using Cohen's kappa and percent agreement. Criterion validity was determined using Pearson Product Moment Correlations between scores on the CAS and serum albumin, weight, BMI, PG-SGA, and hemoglobin. Sensitivity (true positive/true positive + false negative) and specificity (true negative/true negative + false positive) were determined using 5% weight loss as the other determinant of cachexia. Data were analyzed using SPSS® [v.14.0].

Results

The sample consisted of 90 patients with cancer, 25 men (28%) and 65 women (72%). The mean age was 58 years (range 36–84). There was a wide range of cancer diagnoses, with the highest percentage being patients with breast cancer (n = 33, 36%) (see Table 1).

Forty-one percent of the patients (n = 37) in this sample were not classified as having cachexia according to the CAS, whereas 48% (n = 43) had mild cachexia, and

Fill out the scale according to the following instructions:

1. Determine the severity of each criterion for the previous two weeks using Part 1.
2. Sum the number of positive criteria at each level of Part 1.
3. Insert the responses from Part 1 into Part 2 of the scale.
4. Grade the level of cachexia using Part 3 of the scale.

Patient name: _____ ID number: _____ Age: _____
Evaluator (name and role): _____
Diagnosis and stage: _____ Date: _____
Background diseases: _____
Weight (kg): _____ Height (m): _____ BMI (kg/m^2): _____

Part 1

		0	1	2	3	4
Overall status	Functional status	Fully active	Can perform light activity	Limited activity, 50% of the time	50% of time is spent in bed; needs help with activities of daily living	Totally dependent on help for activities of daily living
	Weight loss in the past six months	< 5%	5%–10%	10%–20%	> 20%	
	Body mass index	Normal (< 19)	Moderate (17–19)		Severe weight loss (< 17)	
Physical assessment	Stomatitis	No stomatitis	Pain, sores, and erythema of mucosa	Pain, patchy ulcerations, but still able to eat	Pain, confluent ulceration; needs IV fluids	Same as 3; also needs total parenteral nutrition
	Edema (pretibial or sacral)	None	+1	+2	+3	
	Ascites	None	Asymptomatic	Symptomatic; needs diuretic	Symptomatic; needs centesis	Danger to life
Lab results	Albumin (g/L)	30–50	20–30		< 20	
	Hemoglobin (g/dl)	Normal	10 (normal)	8–9.9	6.5–7.9	< 6.5
	Creatinine	Normal	≤ 10% less than low end of normal range			
Gastrointestinal system	Dysphagia	None	Symptomatic, able to eat a regular diet	Symptomatic, altered eating, uses oral supplements	Symptomatic, severely altered eating or swallowing; IV fluids needed	Needs IV or total parenteral nutrition
	Loss of appetite	Normal	Mild loss	Moderate loss	Severe loss; IV fluids needed	
	Diarrhea	None	Baseline to 4 stools above baseline	4–6 stools over baseline	> 7 stools per day; IV fluids needed for possible electrolyte imbalance	
	Nausea	None	Mild, can eat	Moderate, eats less	Severe, inadequate oral intake; needs IV fluids	
	Vomiting	None	Once a day	2–5 times per day	≥ 6 times per day, continuous; needs IV fluids	

Part 2

	Level 1–2		Level 3–4
Number of items scored at each level	0–1	and	0
	2 or more	and	0
	2 or more	and	1–2
	Any	and	3 and more

Part 3

Degree of Cachexia
No cachexia
Mild cachexia
Moderate cachexia
Severe cachexia

BMI—body mass index; Lab—laboratory

Figure 1. Cachexia Assessment Scale

Note. Based on information from National Cancer Institute Cancer Therapy Evaluation Program, 2010.

Table 1. Types of Cancer Diagnoses in the Study Sample

Type of Cancer	n	%
Breast	33	36
Colon	22	24
Pancreatic	9	10
Lung	5	6
Ovarian	4	4
Melanoma	3	3
Prostate	3	3
Other	11	12

N = 90

Note. Because of rounding, percentages do not total 100.

11% (n = 10) had moderate-to-severe cachexia. Using the PG-SGA, 20% (n = 18) of the patients were found to have mild cachexia, 76% (n = 68) had moderate-to-severe cachexia, and 4% (n = 4) did not experience cachexia.

Reliability Testing

Inter-rater reliability was Cohen's kappa = 0.87 and r = 0.95. Test-retest reliability was found to be moderate (see Table 2). Internal consistency reliability was found to be high (Cronbach-α = 0.84). When BMI was removed from the reliability calculation (because it had a low correlation with the total score, r = 0.17), the Cronbach-α was found to be 0.85.

Validity Testing

The correlation between the CAS and the current gold standard, PG-SGA, was found to be r = 0.58, p = 0.04. Comparisons with other measures are listed in Table 3. Sensitivity when compared to weight loss was found to be 93%, with 64% specificity.

Discussion

The purpose of this study was to develop a tool to assess cachexia in all stages of cancer. The CAS was found to be reliable and valid and was sensitive in identifying patients with cachexia and changes in patients' clinical conditions. Reliability was demonstrated in several ways. Inter-rater reliability was found to be high, possibly because the CAS is composed of objective criteria and commonly used parameters, thereby decreasing the chance for confusion and error. The CAS also is simple to work with as shown by its short time of administration compared to the PG-SGA.

Another type of reliability that was evaluated was test-retest reliability. The correlations were found to be low-to-moderate. Lower correlations imply that the clinical situation was unstable and that the CAS was sensitive enough to detect these changes. Additional evidence of this sensitivity was the finding that the longer the span of time between measurements, the lower the correlation.

Internal consistency reliability was another form of reliability that was measured. The high correlation between the components of the CAS demonstrated that the items within the CAS seem to be measuring a common concept. This point was demonstrated when the internal consistency reliability was further increased when BMI was removed from the tool. BMI has been shown in the literature to poorly correlate with cachexia (Ockenga & Valentini, 2005).

Several types of validity were demonstrated. Content validity was found to be high, with a high level of agreement among experts in oncology related to the appropriateness of the items of the questionnaire. To determine criterion validity, the CAS was compared to the PG-SGA, which is regarded as the gold standard. The results demonstrated a moderate relationship between them. This may be explained by the fact that the tools contain some, but not all, common areas of content domain. For example, according to the literature, albumin is considered to be a prognostic indicator of cachexia (Barrera, 2002; Davis & Dickerson, 2000; Lopaez & Tehrani, 2001). This very important indicator is not included in the PG-SGA.

Differences also were found in the percentage of patients categorized as cachectic using the CAS as opposed to the PG-SGA. A low percentage of patients were found to have cachexia using the CAS as opposed to the vast majority of patients being categorized as having moderate-to-severe cachexia using the PG-SGA. This significant difference between the categorization of patients could be a result of the fact that the CAS contains a range of responses categorizing the severity of the components of cachexia on a scale from 0–4, whereas the PG-SGA has only a "yes" or "no" response for these components. This categorizing of component severity allows the CAS to discriminate between gastrointestinal side effects caused by the disease as opposed to those caused by treatment. It is probable that low levels of severity (levels 1–2) are associated with short-term treatment side effects, whereas higher levels (levels 3–4) of

Table 2. Test-Retest Reliability Using Cohen's Kappa and Pearson Correlation

Data Collection Times	Cohen's Kappa	Pearson Correlation
T1–T2	0.44	0.64
T1–T3	0.16	0.54
T2–T3	0.53	0.73

Note. T1 was at recruitment into the study, T2 was 2–4 weeks later, and T3 was 4–8 weeks after recruitment into the study.

Table 3. Comparison of the Cachexia Assessment Scale With Other Measures of Cachexia Using Pearson Correlations

Measure	Pearson Correlation	p
Albumin	0.76	0.002
Body mass index	–0.04	Not significant
Hemoglobin	0.22	Not significant
PG-SGA	0.58	0.04
Weight loss	0.51	0.011

PG-SGA—Patient-Generated Subjective Global Assessment

severity are more likely to be related to deterioration of the disease.

Criterion validity also was found when the CAS was compared to other known criteria listed in the literature. The correlation between the CAS and albumin level was found to be strong. This finding is supported by Barrera (2002). The correlation between the CAS and weight loss was moderate. This can be explained by the high percentage of women in the sample with breast cancer. These women, as opposed to others with cancer, are not normally expected to have cachexia. According to Hauser, Stockler, and Tattersall (2006), only a very small proportion of end-stage patients with breast cancer suffer from cachexia. This is opposed to a sample of patients with lymphoma (Bauer et al., 2002) who were found to suffer from weight loss.

The use of weight loss as a criterion for determining cachexia is controversial. Some (Fearon, Voss, Hustead, & the Cancer Cachexia Study Group, 2006) have commented that even a 10% level of weight loss cannot be considered as an accurate measure of cachexia because of the simultaneous presence of ascites and edema among patients with cancer as well as other symptoms of nausea and vomiting.

Despite these problems, weight loss is considered as one of the leading criterion in assessing cachexia. Weight loss has been shown to be the first symptom in some cancers (Muscaritoli, Bossola, Aversa, Bellantone, & Rossi Fanelli, 2006; Tisdale, 2001). The current study also supported the use of weight loss as an indicator of cachexia.

A very low correlation was found between the CAS and hemoglobin. This can be a result of the fact that reduction in hemoglobin is a side effect of treatment, but not of cachexia (Barrera, 2002). However, anemia has been shown to be a prognostic indicator of survival along with cachexia and hypoalbuminemia (Barrera, 2002; Hauser et al., 2006).

The correlation with BMI was found to be low and negative. This might be because overweight patients who have an initially high BMI and who then lose weight because of cancer might be categorized as having a normal BMI, and would not be categorized as being cachectic (Ockenga & Valentini, 2005). Bauer et al. (2002) also reported a low and negative correlation with BMI and weight loss. They concluded that patients can have nutrition issues not associated with a normal BMI.

The specificity of the CAS was found to be relatively low. This could be because some of the components of cachexia are a result of the disease itself or are common with the symptom of cachexia and, therefore, are difficult to distinguish from one another.

Limitations

The sample size of this study was small and limited to a few treatment centers with a limited number of types of cancer. Not enough patients were included in the study to allow for a comparison of different types of therapy.

Research Recommendations and Implications for Clinical Practice

A larger sample of patients with many types of cancer, in all the stages of cancer disease and in other types of treatment milieu, is necessary to confirm the reliability and validity of the CAS. Additional attempts should be made to differentiate between side effects of different types of therapy as they apply to cachexia.

Incorporating the assessment and treatment of cachexia in the early stages of cancer treatment is important, not only in the inpatient setting but also in the outpatient setting. Therefore, the CAS should be used in various treatment settings to diagnose cachexia and treat it as soon as possible.

Summary

According to the findings of this study, the CAS is a reliable, valid, and sensitive tool that can be used to identify cachexia in patients with cancer. The CAS is simple and easy to use and can discriminate the symptoms that cause cachexia from the side effects of treatment.

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