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The Memorial Symptom Assessment Scale: an Instrument for the Evaluation of Symptom Prevalence, Characteristics and Distress

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The Memorial Symptom Assessment Scale (MSAS) is a new patient-rated instrument that was developed to provide multidimensional information about a diverse group of common symptoms. This study evaluated the reliability and validity of the MSAS in the cancer population. Randomly selected inpatients and outpatients (n = 246) with prostate, colon, breast or ovarian cancer were assessed using the MSAS and a battery of measures that independently evaluate phenomena related to quality of life. Symptom prevalence in the 218 evaluable patients ranged from 73.9% for lack of energy to 10.6% for difficulty swallowing. Based on a content analysis, three symptoms were deleted and two were added; the revised scale evaluates 32 physical and psychological symptoms. A factor analysis of variance yielded two factors that distinguished three major symptom groups and several subgroups. The major groups comprised psychological symptoms (PSYCH), high prevalence physical symptoms (PHYS H), and low prevalence physical symptoms (PHYS L). Internal consistency was high in the PHYS H and PSYCH groups (Cronback α coefficients of 0.88 and 0.83, respectively), and moderate in the PHYS L group (α = 0.58). Although the severity, frequency and distress dimensions were highly intercorrelated, canonical correlations and other analyses demonstrated that multidimensional assessment (frequency and distress) augments information about the impact of symptoms. High correlations with clinical status and quality of life measures support the validity of the MSAS and indicate the utility of several subscale scores, including PSYCH, PHYS, and a brief Global Distress Index. The MSAS is a reliable and valid instrument for the assessment of symptom prevalence, characteristics and distress. It provides a method for comprehensive symptom assessment that may be useful when information about symptoms is desirable, such as clinical trials that incorporate quality of life measures or studies of symptom epidemiology.

Key words: symptoms, symptom assessment, scale development, psychometrics, symptom distress
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INTRODUCTION

THE NUMEROUS physical [1–4] and psychological [5–8] symptoms experienced by cancer patients are widely regarded to be fundamental elements in the multidimensional construct known as quality of life [9–14]. All recently developed validated measures of cancer-specific quality of life [15–18] assess a selected group of prevalent symptoms, such as pain, fatigue and anxiety, within a broader evaluation of physical, psychological and social functioning. Selected symptoms are also evaluated in many other types of instruments, including those designed to measure psychological or social status [19], general health status [20–22], or global symptom distress [23, 24].

The information about symptoms provided by these multidimensional quality of life measures is not comprehensive, but is clinically meaningful and may be sufficient for many purposes. In some situations, however, a detailed assessment of the prevalence and characteristics of a broad spectrum of physical and psychological symptoms may be desirable. For example, symptom-specific information may be a very useful part of a larger quality of life evaluation in a cancer clinical trial or an epidemiological survey of selected cancer populations.

The ability to acquire a comprehensive evaluation of cancer-related symptomatology has been hindered by unresolved methodological issues and a paucity of validated symptom assessment tools. Although clinical observation and several surveys [3, 25] suggest that symptoms themselves may be multidimensional, perhaps usefully distinguished by descriptors of

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severity, frequency and associated distress, there has been no formal comparison of these varying dimensions, and the most informative method of measuring symptoms is unknown. The only comprehensive validated symptom measure, the Rotterdam Symptom Checklist (RSC) [26–28], evaluates symptoms in terms of distress alone, and, therefore, neither addresses the issue of multidimensional assessment nor provides information about other potentially relevant dimensions, such as severity. Other issues, including the utility of subscales that distinguish physical and psychological symptom morbidity [26] and the value of a measure of global symptom distress [23], have also received limited attention.

Given the potential utility of a comprehensive evaluation of physical and psychological symptomatology in patient care, epidemiological surveys and clinical trials, further efforts are needed to resolve the methodological questions, particularly those related to the issue of multidimensionality, and provide reliable, valid, and useful instruments for symptom assessment. This report describes an initial validation trial of the Memorial Symptom Assessment Scale (MSAS), which was developed as a measure of the prevalence and characteristics of numerous physical and psychological symptoms experienced by diverse types of cancer patients. In studying this instrument, several of these salient methodological issues have been explored.

MATERIALS AND METHODS

Development of the MSAS

Thirty-three symptoms commonly associated with cancer were selected following a review of the literature pertaining to symptom assessment and control. Three dimensions were chosen as potentially relevant to symptom evaluation; (1) severity of the symptom; (2) frequency with which it occurs; and (3) the distress it produces. Separate 4 or 5 point Likert scales were created for each of these dimensions. Twenty-six symptoms were evaluated in terms of all three dimensions; frequency was not relevant for seven symptoms (e.g. hair loss), and for these, only severity and distress were assessed.

The initial version of the MSAS was evaluated in a prospective study conducted during a 14-month period (1990–1991) at the Memorial Sloan-Kettering Cancer Center. The study was approved by the Institutional Review Board, and all patients provided written consent prior to participation. Eligible subjects comprised inpatients or outpatients with cancers of the prostate, colon, breast or ovary. Lack of fluency in English or evidence of either encephalopathy or psychiatric disease severe enough to compromise data collection were exclusion criteria.

Patients were recruited from four inpatient floors or from the three appropriate outpatient clinics. Two clinics and two inpatient floors were randomly selected each week by a research nurse. Outpatients were approached in the clinics on the basis of a screening of the chart for eligibility and perceived availability for the interview. On the inpatient floors, all the charts were screened for these eligibility criteria, and the names of those patients who were candidates for the study were randomly ordered. These inpatients were then approached in turn and asked to participate in the study.

Consenting patients were administered the survey packet by a research nurse. Inpatients who were unable to complete the packet at the time of presentation were permitted to answer the items at any point during the next 24 h; these patients were revisited by the study nurse during this period. Outpatients who were unable to complete the packet were allowed to take it home and return it by mail; these patients were contacted by telephone and encouraged to complete and return the packet.

The contents of packet were presented in randomised order. Each packet contained the following instruments:

(1) Memorial Symptom Assessment Scale
(2) Memorial Pain Assessment Card (MPAC). The MPAC is a validated measure that comprises visual analogue scales (VAS) of pain intensity, pain relief and mood, and an 8-point categorical pain intensity scale [29]. The mood scale, which is significantly correlated with measures of global psychological distress, depression and anxiety, is considered to be a brief measure of global distress.
(3) Revised Rand Mental Health Inventory (RAND). The RAND is an extensively validated measure of psychological state [30–32] that has been applied successfully in the cancer population [33]. In this study, two subscale scores were used, one reflecting global psychological distress (herein termed RAND distress) and one reflecting positive affect (herein termed RAND well-being).
(4) Functional Living Index-Cancer (FLIC). The FLIC is a widely used, cancer-specific quality of life scale [16]. In the present study, the total score was used as a general measure of quality of life.
(5) Symptom Distress Scale (SDS). The SDS is a 13-item scale that evaluates 11 symptoms in terms of either frequency, intensity or distress, and provides a valid measure of global symptom distress [23].
(6) Karnofsky Performance Status Scale (KPS). The KPS is a well-known health professional-rated performance status scale. A validation study strongly suggests that the score reflects physical functioning of the patient [34].

Data analysis

Frequency distributions for all items were obtained, and the responses to an open-ended question that requested information about any additional symptoms were tabulated. Symptom prevalence and characteristics were evaluated in terms of tumour type, treatment setting and demographic variables.

The factor structure of the MSAS was first evaluated using a principal components factor analysis with varimax rotation. Due to the high intercorrelations among many symptoms, this analysis demonstrated an overriding influence of one factor, which correlated strongly with the mean for all symptoms and probably reflected the global degree of symptomatology. A factor analysis of variance (FANOVA) was then performed [35] to better assess patterns of correlation that might be obscured by the prominent global factor. FANOVA is a principal components factor analysis applied after subtracting each patient's 33-item mean score from the individual item scores. The factor solution indicated by the FANOVA yielded meaningful groupings of symptoms, the internal consistency of which was assessed using Cronbach's α coefficient [36].

All other analyses required computation of the total MSAS score or subscale scores. A simple method of scoring was developed to enhance the utility of the instrument in future clinical and research applications. This method, which yields values between zero and four for the total score and each subscale score of interest, is described in the Appendix. A patient was excluded from any analysis that used these summary scores if more than 13% of items were missing from the MSAS; severity, frequency and distress were each considered an item for this calculation.

Several approaches were used to evaluate the independence and importance of the three dimensions assessed by the MSAS—severity, frequency and distress. Firstly, simple correlation coefficients were calculated to examine the overall degree to which the dimensions were related to each other. Items were included in these analyses only if the symptom was experienced by the patient. Secondly, canonical correlation analyses and multiple regression analyses were used to obtain a global measure of the extent to which each dimension added information about the overall clinical status of the patients. For the canonical correlation analyses, overall clinical status was measured as a combination of the scores on the validation measures [FLIC, RAND distress, RAND well-being, KPS and mood visual analogue scale (VAS)]. In the multiple regression analyses, the scores on each of the validation measures (e.g. FLIC) were used as dependent variables and the scores on each of the severity, frequency and distress subscales were entered as independent variables.

To acquire additional information about the validity of the MSAS, subscale scores derived from the symptom groups identified by the FANOVA were correlated with scores on the validation measures, including the FLIC, RAND distress, RAND well-being, Mood VAS and KPS. Differences in symptom scores were also evaluated for groups that are known to vary clinically, specifically inpatients versus outpatients, and patients with early disease versus those with advanced disease, and a score specifically created to assess global symptom distress was compared with the score on the SDS.

RESULTS

A total of 297 patients consented to participate in the study. This group represented approximately three-quarters of those inpatients and outpatients who fulfilled screening criteria and were available for recruitment by the research nurse. Of those who consented, 246 (82.8%) returned the survey packet. 28 of the patients who returned the packet were excluded from the analysis due to failure to complete 13% or more of the MSAS items (20 patients), failure to complete the MSAS according to its directions (3 patients), or inappropriate diagnosis (5 patients). The remaining 218 patients (88.6% of those who returned the study packet and 73.4% of the total recruited into the study) were included in the analysis of reliability and validity. There were no significant differences in age, gender, extent of disease, or educational level between those included in the analysis and those excluded. The clinical characteristics of the study sample are described in Table 1.

Table 1. Clinical characteristics of the patient sample

	Number (%)
Age (years)	
Mean	55.5
Range	23–86
Sex	
Male	71 (33)
Female	147 (67)
Tumour type	
Colon	60 (28)
Prostate	38 (17)
Breast	70 (32)
Ovarian	50 (23)
Extent of disease	
No evidence of active cancer	19 (9)
Local or locoregional disease	60 (28)
Metastatic disease	123 (56)
Unknown	16 (7)
Treatment setting	
Inpatient	123 (56%)
Outpatient	95 (44%)

Structure of the MSAS: symptoms and subscales

Symptom prevalence was high, ranging from 73.4% for lack of energy to 10.6% for difficulty swallowing. Across patients, there was great variability in severity, frequency and distress scores (Table 2). Similar variability was observed in the other instruments. The median (range) KPS score was 90 (50–100); 80% of the sample had a KPS score > 70.

Content analysis. A content analysis suggested several changes that have now been incorporated into a revised version of the MSAS (Figure 1a-c). Three symptoms were deleted. Urinary accidents and nightmares were removed because of low prevalence and scores that were highly correlated with other symptoms, specifically problems with urination and difficulty sleeping, respectively. Weight gain was deleted because it was the only symptom that yielded scores that were inversely correlated with summary indicators of global distress; this finding suggested that most patients perceived that weight gain was a sign of health, rather than a symptom of disease.

Other changes were made on the basis of responses to open-ended questions. Two symptoms, changes in skin and sweats, were mentioned repeatedly and were added to the revised MSAS for evaluation in future studies. Some patients observed that the frequency dimension was not a relevant descriptor for mouth sores, and this item was deleted.

Factor analysis. The principal components factor analysis was computed using the average of the severity, frequency and distress scores for each of 33 symptoms (Table 3). As noted previously, the generally high correlations between symptoms were reflected in this analysis by a first principal component that accounted for 24% of the variance and correlated highly with most symptoms. This presumably reflected a global factor indicative of overall symptomatology.

The FANOVA removed the influence of this factor, and allowed the analysis to focus on two major factors associated with meaningful groupings of symptoms (Table 4 and Figure 2). One group, herein termed PSYCH, contained six symptoms that appeared to relate to psychological state. This group could be divided into a subgroup with four symptoms that were all overtly emotional in nature (herein termed EMOT) and a subgroup with two symptoms (difficulty sleeping and difficulty concentrating) that was termed CONC. A second large group, labelled PHYS H, contained 12 relatively prevalent physical symptoms. This group similarly yielded two subgroups, one that comprised symptoms that may be related to pain and its treatment (termed PAINTREAT) and one that comprised items that largely related to gastrointestinal distress (termed GASTR). Finally, a third large group, labelled PHYS L, contained 15 physical symptoms and could be empirically distinguished from the PHYS H group on the basis of a relatively low frequency of most of the symptoms.

The internal consistency of these groupings was evaluated using Cronbach's α coefficient. The coefficients were high for the PSYCH grouping (0.835) and its subgroup, EMOT (0.851),

Table 2. Prevalence and characteristics of symptoms determined by the Memorial Symptom Assessment Scale in 218 cancer patients

Symptom	Overall prevalence	Degree when symptom was present: Intensity Mod–VSev (%)*	Frequency Freq–Con (%)†	Distress QB–VM (%)‡
Lack of energy	73.4	77.0	55.3	34.2
Worrying	72.4	72.3	38.1	23.2
Feeling sad	67.4	68.7	23.8	21.1
Pain	63.1	74.6	54.3	48.6
Feeling nervous	62.4	56.7	26.1	23.9
Feeling drowsy	59.7	67.7	40.0	17.7
Dry mouth	55.3	68.1	47.1	21.8
Difficulty sleeping	52.8	73.0	42.6	32.2
Feeling irritable	47.2	62.1	23.3	19.4
Nausea	44.7	54.6	27.8	22.7
Lack of appetite	44.5	82.7	55.1	29.6
Difficulty concentrating	40.1	48.3	20.7	12.6
Feeling bloated	38.7	81.0	47.6	25.0
Change in the way food tastes	37.2	72.5	NE	30.0
Numbness/tingling in hands/feet	36.4	60.3	50.0	26.9
Constipation	33.6	79.5	NE	42.5
Cough	29.4	48.4	18.8	18.8
'I don't look like myself'	28.2	72.9	NE	37.3
Itching	27.2	54.1	29.5	19.7
Swelling of arms or legs	27.5	66.7	NE	40.0
Weight loss	27.0	42.1	NE	21.1
Weight gain	25.7	30.4	NE	21.4
Diarrhoea	23.9	59.6	30.8	17.3
Dizziness	23.4	51.0	17.6	17.6
Problems with sexual interest or activity	23.3	78.0	52.0	22.0
Shortness of breath	22.9	64.0	22.0	24.0
Vomiting	21.1	65.2	32.6	41.3
Hair loss	17.1	62.2	NE	37.8
Problems with urination	15.6	72.2	44.4	30.6
Mouth sores	12.9	65.5	44.8	31.0
Urinary accidents	12.4	51.9	18.5	37.0
Nightmares	11.9	61.5	34.6	26.9
Difficulty swallowing	10.6	82.6	47.8	52.5

*Percentage moderate to very severe; †percentage frequently to constantly; ‡percentage quite a bit to very much. NE, not evaluated.

and the PHYS H grouping (0.882) and its subgroups, PAINTREAT (0.837) and GASTR (0.753). The α coefficients for PHYS L (0.580) and the subgroup CONC (0.452) were moderate to low.

Validity of the MSAS

The analyses used to validate the MSAS had two overriding objectives. Firstly, several analyses clarified the role of the different dimensions (severity, frequency and distress) and evaluated the potential of multidimensional symptom assessment. Secondly, other analyses determined the ability of the total score and subscale scores to measure global symptom distress and contribute to an understanding of quality of life.

Dimensionality of the MSAS. For all patients, the correlation between mean severity scores and mean frequency scores across symptoms was $r = 0.80$; the correlation between mean severity scores and mean distress scores was $r = 0.70$, and the correlation between mean frequency scores and mean distress scores was $r = 0.43$. As noted previously, these means were computed only for those symptoms actually experienced by the patients. The correlations suggest that symptom severity was more closely related to frequency and distress than frequency and distress were related to each other.

Pairwise correlations among the three dimensions were also calculated for each symptom. The average correlation between severity and frequency for the 26 symptoms graded according to these two dimensions was $r = 0.65$ (range 0.27–0.80). The average correlation for severity and distress was $r = 0.67$ ($n = 32$ symptoms, range 0.43–0.87), and the average correlation for frequency and distress was $r = 0.55$ ($n = 26$ symptoms, range 0.21–0.77).

For the canonical correlation analysis, scores for severity, frequency and distress were calculated for each of the symptom groups, EMOT, CONC, PAINTREAT, GASTR and PHYS L. Separate canonical correlations compared the five distress subscale scores, the five frequency subscale scores and the five severity subscale scores, respectively, with the scores on the validation measures (specifically FLIC, RAND distress, RAND well-being, KPS and Mood VAS). The first canonical correlation was higher for the set of distress scores (0.871) than the set of frequency scores (0.854) or severity scores (0.840). In addition, the comparison between the set of distress scores and the scores on the validation measures yielded three significant canonical

(a)

MEMORIAL SYMPTOM ASSESSMENT SCALE

NAME: DATE:

SECTION 1:

INSTRUCTIONS: We have listed 24 symptoms below. Read each one carefully. If you have had the symptom during this past week, let us know how OFTEN you had it, how SEVERE it was usually and how much it DISTRESSED OR BOTHERED you by circling the appropriate number. If you DID NOT HAVE the symptom, make an "X" in the box marked "DID NOT HAVE".

DURING THE PAST WEEK. Did you have any of the following symptoms?	DID NOT HAVE	IF YES, How OFTEN did you have it?				IF YES, How SEVERE was it usually?				IF YES, How much did it DISTRESS or BOTHER you?				
		Rarely	Occasionally	Frequently	Almost constantly	Slight	Moderate	Severe	Very severe	Not at all	A little bit	Somewhat	Quite a bit	Very much
Difficulty concentrating		1	2	3	4	1	2	3	4	0	1	2	3	4
Pain		1	2	3	4	1	2	3	4	0	1	2	3	4
Lack of energy		1	2	3	4	1	2	3	4	0	1	2	3	4
Cough		1	2	3	4	1	2	3	4	0	1	2	3	4
Feeling nervous		1	2	3	4	1	2	3	4	0	1	2	3	4
Dry mouth		1	2	3	4	1	2	3	4	0	1	2	3	4
Nausea		1	2	3	4	1	2	3	4	0	1	2	3	4
Feeling drowsy		1	2	3	4	1	2	3	4	0	1	2	3	4
Numbness/ tingling in hands/feet		1	2	3	4	1	2	3	4	0	1	2	3	4
Difficulty sleeping		1	2	3	4	1	2	3	4	0	1	2	3	4
Feeling bloated		1	2	3	4	1	2	3	4	0	1	2	3	4
Problems with urination		1	2	3	4	1	2	3	4	0	1	2	3	4

(b)

DURING THE PAST WEEK. Did you have any of the following symptoms?	DID NOT HAVE	IF YES, How OFTEN did you have it?				IF YES, How SEVERE was it usually?				IF YES, How much did it DISTRESS or BOTHER you?				
		Rarely	Occasionally	Frequently	Almost constantly	Slight	Moderate	Severe	Very severe	Not at all	A little bit	Somewhat	Quite a bit	Very much
Vomiting		1	2	3	4	1	2	3	4	0	1	2	3	4
Shortness of breath		1	2	3	4	1	2	3	4	0	1	2	3	4
Diarrhoea		1	2	3	4	1	2	3	4	0	1	2	3	4
Feeling sad		1	2	3	4	1	2	3	4	0	1	2	3	4
Sweats		1	2	3	4	1	2	3	4	0	1	2	3	4
Worrying		1	2	3	4	1	2	3	4	0	1	2	3	4
Problems with sexual interest or activity		1	2	3	4	1	2	3	4	0	1	2	3	4
Itching		1	2	3	4	1	2	3	4	0	1	2	3	4
Lack of appetite		1	2	3	4	1	2	3	4	0	1	2	3	4
Dizziness		1	2	3	4	1	2	3	4	0	1	2	3	4
Difficulty swallowing		1	2	3	4	1	2	3	4	0	1	2	3	4
Feeling irritable		1	2	3	4	1	2	3	4	0	1	2	3	4

Figure 1. (a) Page 1, (b) page 2. The revised version of the Memorial Symptom Assessment Scale.

variables, whereas the analyses that evaluated the sets of frequency scores and severity scores, respectively, each yielded two canonical variables. These findings suggest that the distress measure was the most informative single dimension.

To determine whether the frequency or severity subscale scores added information beyond that contained in the distress score, partial correlation was combined with the canonical correlation analyses. The canonical correlations between the frequency scores for the five MSAS subscales and the scores on the validation measures were computed after partialling out the five distress subscale scores. This yielded one highly significant canonical variable ($P = 0.0038$) and one marginally significant

(c)

SECTION 2:

INSTRUCTIONS: We have listed 8 symptoms below. Read each one carefully. If you have had the symptom during this past week, let us know how SEVERE it was usually and how much it DISTRESSED OR BOTHERED you by circling the appropriate number. If you DID NOT HAVE the symptom, make an "X" in the box marked "DID NOT HAVE".

DURING THE PAST WEEK. Did you have any of the following symptoms?	DID NOT HAVE	IF YES, How SEVERE was it usually?				IF YES, How much did it DISTRESS or BOTHER you?				
		Slight	Moderate	Severe	Very severe	Not at all	A little bit	Somewhat	Quite a bit	Very much
Mouth sores		1	2	3	4	0	1	2	3	4
Change in the way food tastes		1	2	3	4	0	1	2	3	4
Weight loss		1	2	3	4	0	1	2	3	4
Hair loss		1	2	3	4	0	1	2	3	4
Constipation		1	2	3	4	0	1	2	3	4
Swelling of arms or legs		1	2	3	4	0	1	2	3	4
"I don't look like myself"		1	2	3	4	0	1	2	3	4
Changes in skin		1	2	3	4	0	1	2	3	4
**IF YOU HAD ANY OTHER SYMPTOMS DURING THE PAST WEEK, PLEASE LIST BELOW AND INDICATE HOW MUCH THE SYMPTOM HAS DISTRESSED OR BOTHERED YOU.										
Other:						0	1	2	3	4
Other:						0	1	2	3	4
Other:						0	1	2	3	4

Figure 1. (c) Page 3. The revised version of the Memorial Symptom Assessment Scale.

canonical variable ($P = 0.068$). There were no significant canonical correlations when the distress subscale scores were partialled out from the comparison between the severity scores and the validation measures. Combined with the original canonical correlation analyses, the latter findings suggest that the distress measurement provided the most information about quality of life, as determined by these selected validation instruments, and that the frequency measurement, but not the severity measurement, yielded significant additional information. The issue of multidimensional assessment was further addressed through stepwise multiple regression analyses that were performed using the severity, frequency and distress subscores, respectively, as predictors of each of the quality of life measures. In these analyses, the distress score generally accounted for the largest component of the variance, and either frequency or severity, but not both, entered the model as significant predictors of quality of life.

In summary, these analyses support the value of multidimensional symptom assessment. The data suggest that the use of a distress scale yields the most information about the relationship between symptoms and quality of life, but that the combination of a distress measurement with either a frequency or severity measurement provides significantly more information than the distress measurement alone. In the present study, frequency appeared to be a more illuminating complement to distress than severity.

Validity of MSAS scores. Convergent and discriminant validity [37] of the MSAS was tested by correlating its various potential subscale scores with the scores on the validation measures (Table 5). The latter were correlated with (1) total MSAS score (averaged across three dimensions and all symptoms); (2) single dimensions of severity, frequency and distress, averaged across all symptoms; and (3) major symptom groups, averaged across the three dimensions. These analyses demonstrated highly significant associations between the MSAS or MSAS subscales and the validation measures. The strongest association was between the MSAS and the overall measure of quality of life, the FLIC. As expected, PSYCH and EMOT correlated more highly with RAND distress and Mood VAS than did other MSAS subscales, whereas PHYS H and its subgroups correlated more strongly with performance status (measured with the KPS) than with the psychological symptoms.

Construct validity was also tested by comparing MSAS scores in subpopulations that varied clinically. In the sample acquired for the present study, it would be anticipated that inpatients would have higher symptom distress than outpatients, and that patients with more advanced disease would be more symptomatic than those with earlier disease. These predictions were confirmed (Table 6).

To identify a brief subscale that could provide a gross measure of global symptom distress, the results of the canonical correlation analyses were combined with empirical testing of various subscale scores to isolate a small group of symptoms, the combination of which correlated highly with the validation measures. The highest correlations were obtained from a combination of the frequency items from the EMOT group plus the distress items from the PAINTREAT group (Figure 2). Like the previously validated symptom distress measure, the SDS, the score from these ten items [herein termed the MSAS-Global

Table 3. Principal components factor analysis with varimax rotation using the average of the intensity, frequency and distress scores for 32 symptoms (n = 218)

	Prevalence (%)	Factor loadings 1	Factor loadings 2
Worrying	72.4	−0.02	0.78
Feeling sad	67.4	0.03	0.81
Feeling nervous	62.4	0.05	0.74
Difficulty sleeping	52.8	0.22	0.53
Feeling irritable	47.2	0.14	0.76
Difficulty concentrating	40.1	0.31	0.55
Lack of energy	73.4	0.62	0.39
Pain	63.1	0.63	0.28
Feeling drowsy	59.7	0.60	0.39
Dry mouth	53.3	0.48	0.43
Nausea	44.7	0.79	0.01
Lack of appetite	44.5	0.77	0.21
Feeling bloated	38.7	0.48	0.28
Change in taste	37.2	0.63	0.14
Constipation	33.6	0.53	0.27
Weight loss	27.0	0.53	0.17
Dizziness	23.5	0.53	0.21
Vomiting	21.1	0.73	0.08
Numbness/tingling in hands/feet	36.4	0.18	0.25
Cough	29.5	0.15	0.16
'I don't look like myself'	28.2	0.24	0.38
Itching	27.8	0.08	0.26
Swelling of arms or legs	27.5	0.20	0.32
Diarrhoea	23.9	0.32	0.10
Problems with sexual interest or activity	23.3	0.02	0.26
Shortness of breath	22.9	0.15	0.40
Hair loss	17.1	0.16	−0.05
Problems with urination	15.6	0.23	0.23
Mouth sores	12.9	0.23	0.15
Urinary accidents	12.4	0.20	0.21
Nightmares	11.9	0.10	0.30
Difficulty swallowing	10.6	0.36	0.23

Symptoms are grouped according to the results of the factor analysis of variance (see Table 4 and Figure 2). Weight gain had a relationship to the principal components opposite to that of the other symptoms and was deleted from the analysis (see text).

Distress Index (GDI)] was highly correlated with the validation measures (Table 7).

DISCUSSION

The importance of symptom assessment in the cancer population is indicated by the extraordinarily high prevalence of physical and psychological complaints and the impact of symptoms on perceived quality of life [1–8]. Systematic symptom assessment may be extremely informative in routine patient care and a variety of research settings, including clinical trials of antineoplastic or supportive therapies and surveys designed to assess quality of life issues in selected populations.

Comprehensive symptom assessment should be viewed as a potentially informative component of a quality of life evaluation. Intensive research during the past decade has yielded reliable and valid assessment instruments that derive from an understanding of quality of life as a multidimensional construct that addresses the positive and negative aspects of physical, psychological, and social functioning, as well as other issues [9–14]. These instruments, such as the QLQ-C30 of the European Organization for Research and Treatment of Cancer [15], the FLIC [16, 38], the Functional Assessment of Cancer Therapy Scale [18], the Cancer Rehabilitation Evaluation System [17] and the SF-36 form of the Medical Outcome Study [20], evaluate specific symptoms, such as pain, fatigue and psychological distress, among other factors that may determine quality of life. Although the various components of quality of life could also be evaluated through the use of multiple instruments, each devoted to a specific domain (e.g. physical or psychological functioning, or symptom distress), the trend toward the development of brief multidimensional measures is clearly justified by the efficiency of this assessment and the need to obtain a valid overall measurement of quality of life. High rates of patient compliance can be obtained with such instruments, even in the context of multicentre research [39].

The advantages inherent in a multidimensional measure, however, come at the cost of less information about any of the various influences on quality of life than could otherwise be obtained through the use of more specific instruments. The symptom-related information included in these measures is focused on a relatively small number of common problems, and cannot clarify the prevalence rates or characteristics of the diverse physical and psychological symptoms experienced by cancer patients. For example, the newest version of the instrument developed by the European Organization for Research and Treatment of Cancer, the QLQ-C30, provides more data relevant

Table 4. Factor analysis of variance using the average of the intensity, frequency and distress scores for 32 symptoms (n = 218)

	Prevalence (%)	Factor loadings 1	Factor loadings 2
PSYCH group			
Worrying	72.4	−0.52	0.52
Feeling sad	67.4	−0.55	0.50
Feeling nervous	62.4	−0.45	0.50
Difficulty sleeping	52.8	−0.22	0.18
Feeling irritable	47.2	−0.46	0.42
Difficulty concentrating	40.1	−0.16	0.25
PHYS H group			
Lack of energy	73.4	0.42	0.45
Pain	63.1	0.42	0.21
Feeling drowsy	59.7	0.33	0.29
Dry mouth	55.3	0.15	0.28
Nausea	44.7	0.67	−0.06
Lack of appetite	44.5	0.65	0.28
Feeling bloated	38.7	0.18	0.00
Change in taste	37.2	0.44	−0.02
Constipation	33.6	0.31	0.23
Weight loss	27.0	0.24	−0.07
Dizziness	23.5	0.17	−0.24
Vomiting	21.1	0.55	−0.23
PHYS L group			
Numbness/tingling in hands/feet	36.4	−0.15	−0.23
Cough	29.5	−0.16	−0.33
'I don't look like myself'	28.2	−0.17	−0.07
Itching	27.8	−0.22	−0.27
Swelling of arms or legs	27.5	−0.17	−0.21
Diarrhoea	23.9	−0.01	−0.31
Problems with sexual interest or activity	23.3	−0.23	−0.09
Shortness of breath	22.9	−0.24	−0.13
Hair loss	17.1	−0.12	−0.50
Problems with urination	15.6	−0.13	−0.34
Mouth sores	12.9	−0.16	−0.41
Urinary accidents	12.4	−0.19	−0.39
Nightmares	11.9	−0.29	−0.35
Difficulty swallowing	10.6	−0.06	−0.26

See text for abbreviations. Weight gain had a relationship to the principal components opposite to that of the other symptoms and was deleted from the analysis (see text).

to symptoms than other measures of this type, but still evaluates only eight physical symptoms (fatigue, pain, nausea and vomiting, dyspnoea, anorexia, sleep disturbance, constipation and diarrhoea) and several psychological symptoms (tension, worry, irritability and depression) [15]. These quality of life instruments are not designed to provide a comprehensive understanding of the symptoms experienced by the patient or offer a measurement of global symptom distress.

The use of a specific symptom assessment scale can acquire additional information and is appropriate when data pertaining to the prevalence or characteristics of numerous symptoms would be valuable, or global symptom distress is of interest. A validated measure of global symptom distress, the SDS, is available [23, 24, 40], but like the multidimensional quality of life instruments, provides limited information about a small number of common symptoms. Quantitative data about a large group of common symptoms may be more useful, particularly in tracking the clinical changes that result from therapeutic interventions. At the present time, such information could be obtained from the RSC, a validated measure that provides information about a large number of physical and psychological symptoms [26–28]. The latter instrument, however, does not address the possible utility of multidimensional symptom evaluation, and provides no information about symptom characteristics other than associated distress.

The MSAS describes the prevalence and characteristics of diverse physical and psychological symptoms, and provides quantitative information about global symptom distress and the impact of symptoms on various aspects of quality of life. Both the total score and thhe 10-item MSAS-GDI validly measure overall symptom distress. A PSYCH subscale, which is derived from the scores on six symptoms, may be interpreted as a measure of global psychological distress, and a PHYS subscale, which is taken from the PHYS H grouping of symptoms, may be considered an indicator of physical symptomatology (see Appendix). The information provided by these summary scores may be supplemented by a detailed description of the severity, frequency or distress associated with individual symptoms, such

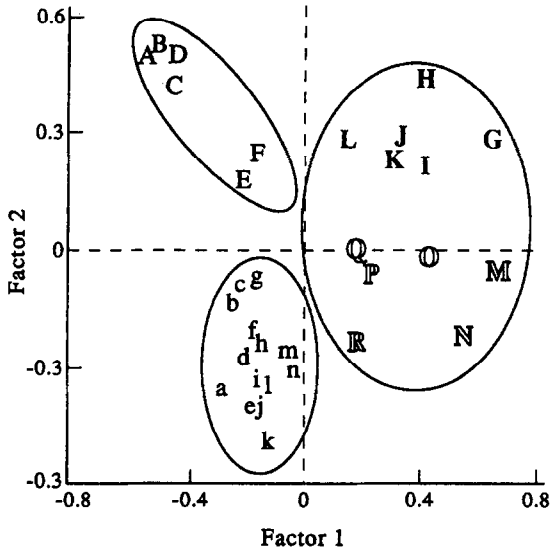

Figure 2. Results of the factor analysis of variance. There are two main factors that distinguish three major groups of symptoms. The PSYCH group can be divided into two subgroups, EMOT (related to psychological state) and CONC (aparently related to concentration). PSYCH is A–F; EMOT is A–D; and CONC is E and F (A = feeling sad; B = worrying; C = feeling irritable; D = feeling nervous; E = difficulty sleeping; F = difficulty concentrating). PHYS H, high prevalence physical symptoms, has two subgroups, PAINTREAT (appears to reflect symptoms associated with pain and its treatment) and GASTR (reflects gastrointestinal symptoms). The PHYS H group is G–R; PAINTREAT is G–L; and GASTR is M–R (G = lack of appetite; H = lack of energy; I = pain; J = feeling drowsy; K = constipation; L = dry mouth; M = nausea; N = vomiting; O = change in taste; P = weight loss; Q = feeling bloated; R = dizziness. PHYS L comprises low prevalence physical symptoms. The PHYS L group is a–o (a = nightmares; b = shortness of breath; c = problems with sexual interest or activity; d = itching; e = urinary accidents; f = swelling of arms or legs; g = 'I don't look like myself'; h = numbness/tingling in hands/feet; i = cough; j = mouth sores; k = hair loss; l = urinary problems; m = difficulty swallowing; n = diarrhoea).

as pain or nausea, which may be particularly relevant in some circumstances, such as during treatments that specifically affect these complaints.

The 10-item GDI is likely to be the most clinically useful subscale of the MSAS. This brief scale could be administered alone if global symptom distress is the only characteristic of interest in a population. When the full instrument is administered, the subscale score is still likely to be a useful measure of global distress, which is more easily interpreted than the MSAS total score. The MSAS total score and the MSAS-GDI are determined by both the number of symptoms experienced by the patient and the severity, frequency or distress associated with each symptom. A patient with many mild symptoms can have a score identical to a patient with fewer, but more distressing, symptoms. The relationship between the symptom distress score and the clinical status of the patient is more likely to be interpreted appropriately through the use of the brief subscale score, which is less influenced by the endorsement of many mild symptoms.

The present study has also clarified some of the unresolved methodological issues surrounding symptom measurement. The data confirm previous studies [23] in demonstrating that valid measurement of global symptom distress requires a very limited evaluation, specifically unidimensional assessment of a small group of highly prevalent psychological and physical symptoms. The MSAS-GDI, like the SDS, provides this type of assessment.

More importantly, the results provide empirical evidence that the impact of symptoms is more efficiently obtained from a distress scale than measures of severity or frequency. If a single symptom measurement is preferred, a distress scale would be the most likely to illuminate the influence of symptoms on quality of life.

Multidimensional assessment, however, may have even greater potential to clarify the impact of symptoms. In the present study, the combination of a distress measure and a frequency measure provided significantly more information than the distress measure alone. Symptom severity was a clinically relevant descriptor that did not independently augment information about the impact of symptoms on quality of life. The revised version of the MSAS (Figure 1) retains three dimensions to allow further evaluation of these results in different cancer populations and capture the clinically relevant information inherent in the severity scale.

The completion rate for the MSAS was acceptable in the context of the study. Additional studies are needed to determine if the respondent burden associated with the multidimensional MSAS is justified by the utility of the extensive descriptive data it provides. A shorter version, which could conceivably provide adequate information about symptom prevalence and characteristics in many cases, is undergoing evaluation. It is also possible

Table 5. Correlations between validation measures and MSAS summary scales and subscales

	RAND well-being (n = 202)	RAND distress (n = 202)	FLIC (n = 209)	KPS (n = 218)	Mood VAS (n = 210)
Total MSAS	−0.60	0.65	−0.78	−0.58	−0.40
PSYCH	−0.59	0.80	−0.60	−0.31	−0.48
EMOT	−0.56	0.82	−0.56	−0.30	−0.51
CONC	−0.47	0.53	−0.51	−0.26	−0.29
PHYS H	−0.53	0.48	−0.75	−0.64	−0.30
PAINTREAT	−0.58	0.55	−0.75	−0.65	−0.35
GASTR	−0.39	0.32	−0.64	−0.53	−0.19
PHYS L	−0.36	0.41	−0.52	−0.37	−0.26

MSAS total score and subscale scores are computed as described in Methods. Sample size varies because comparisons were performed only on those who completed both the MSAS and the validation measure. See text for abbreviations.

Table 6. MSAS scores in inpatients versus outpatients and advanced disease versus early disease

	Number	MSAS-GDI Mean (S.D.)	*P* value
Treatment setting			
Outpatient	95	0.93 (0.70)	< 0.0001
Inpatient	123	1.53 (0.87)	
Extent of disease			
No evidence of disease	19	0.85 (0.61)	
Local or locoregional disease	60	1.21 (0.80)	0.018
Metastatic disease	123	1.41 (0.88)	

Table 7. Correlations between validation measures and total MSAS and the MSAS-GDI

	RAND well-being	RAND distress	FLIC	KPS	Mood VAS
MSAS-GDI	−0.66	0.79	−0.78	−0.60	−0.48
SDS[1]	−0.59	0.58	−0.81	−0.59	−0.40

See text for abbreviations. The symptoms chosen for the MSAS-GDI comprise the frequency scores for four psychological symptoms (worrying, feeling sad, feeling nervous and feeling irritable) and the distress scores for six physical symptoms (lack of appetite, pain, constipation, lack of energy, feeling drowsy and dry mouth). *The correlations with the SDS were performed using only those patients who had an evaluable MSAS; n = 201 for the correlations with RAND well-being and distress, n = 205 for the correlations with FLIC and Mood VAS, and n = 210 for the correlation with KPS.

that other, perhaps treatment-specific symptoms that are not included in the MSAS may require assessment in some situations. An approach in which additional face valid symptom scales are added to the MSAS for specific purposes may be useful, and is also under investigation.

The results of this initial trial suggest that the MSAS is a valid instrument for symptom assessment in the cancer population. Replication in patients with other types of cancer is needed to confirm these findings and determine the need to alter the list of symptoms to include others that may have been underrepresented in the study group. Additional studies are also needed to establish reliability and validity with repeated administrations, clarify the value of the various subscale scores, and determine the utility of the instrument as an outcome measure in clinical trials and other cancer-related investigations.

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APPENDIX

SCORING OF THE MEMORIAL SYMPTOM ASSESSMENT SCALE

The revised MSAS questions patients about their experiences of 32 symptoms during the previous week. Twenty-four symptoms are evaluated in terms of severity, frequency and distress, and eight symptoms are evaluated in terms of severity and distress. A patient may indicate that a symptom was not experienced by checking a column labelled 'did not have'. If a symptom was experienced, the patient describes its severity on a 4-point categorical scale; its frequency, if appropriate, on a 4-point categorical scale; and its associated distress on a 5-point categorical scale.

The values for the severity and frequency measurements are scales 1 to 4, where 1 is 'slight' on the severity scale and 'rarely' on the frequency scales, and 4 is 'very severe' on the severity scale and 'almost constantly' on the frequency scale. For ease of calculation, the values on the distress scale are set to a range that is roughly similar to the other dimensions: 'not at all' is scored as 0.8, 'a little bit' is 1.6, 'somewhat' is 2.4, 'quite a bit' is 3.2, and 'very much' is 4.

The initial step calculates a score for each symptom. If a symptom is not experienced, each dimension is scored as 0, and the score for that symptom is 0. If a symptom is experienced, the score for that symptom is determined as the average of the scores on the severity, frequency and distress scales, or if appropriate, on the severity and distress scales only. Items that are missing are simply not included in the calculation of this symptom score. If a symptom that is supposed to have all three dimensions completed by the patient actually has two dimensions completed, the score for that symptom is the average of the two items rather than the three items. Only a selected amount of missing data should be allowed before a patient is excluded from the calculation of MSAS scores; in the present study, this was arbitrarily established at 13% of the items.

In calculating the Global Distress Index, only one dimension is used for each symptom, and the score on the single dimension is considered the symptom score. As discussed in the text, a short form of the MSAS can be developed that similarly used a score on a single dimension as the overall symptom score.

The symptom scores are combined into various subscale scores:

(1) The PSYCH subscale score is the average of the symptom scores for six symptoms: feeling sad, worrying, feeling irritable, feeling nervous, difficulty sleeping and difficulty concentrating.
(2) The PHYS subscale score is the average of the symptom scores for the 12 symptoms identified in the present study as high prevalence physical symptoms: lack of appetite, lack of energy, pain, feeling drowsy, constipation, dry mouth, nausea, vomiting, change in taste, weight loss, feeling bloated and dizziness.
(3) The Global Distress Index is the average of the single dimension scores for 10 symptoms: the frequency scores for feeling sad, worrying, feeling irritable and feeling nervous, and the distress scores for lack of appetite, lack of energy, pain, feeling drowsy, constipation and dry mouth.
(4) The total MSAS score is the average of the symptom scores for all 32 symptoms. If the original MSAS is used, each symptom score is an average of the dimensions; if the short form is used, each symptom score is the score on the single dimension used to assess the symptom. As discussed in the text, the total MSAS score can provide valid information about symptom distress, but is less meaningful from the clinical perspective than the Global Distress Index.