PERGAMON

European Journal of Cancer 37 (2001) 376–384

European Journal of Cancer

www.ejconline.com

Predicting anxiety and depression among cancer patients: a clinical model

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Received 7 June 2000; received in revised form 3 November 2000; accepted 7 November 2000

Abstract

The aim of this study was to investigate the possibility of predicting anxiety and depression 6 months after the cancer diagnosis on the basis of measures of anxiety, depression (Hospital Anxiety and Depression, HAD scale), subjective distress (Impact of Event, IES scale) and some aspects of social support in connection with the diagnosis. A further purpose was to attempt identification of individual patients at risk of prolonged psychological distress, and to develop an easily applicable clinical tool for such detection. A consecutive population-based series of 522 newly diagnosed patients with breast, colorectal, gastric and prostate cancer were interviewed in connection with the diagnosis and 6 months later. Anxiety and depression close to the diagnosis explained 39% of the variance in anxiety and depression 6 months later. Patients scoring as doubtful cases/cases for HAD anxiety and/or depression were more than 11 times more likely than non-cases to score as doubtful cases/cases at 6 months. Additional risk factors were having an advanced disease and nobody in addition to the family to rely on in case of difficulties. Levels of anxiety and depression at diagnosis predict a similar status 6 months later. The results also indicate that the HAD scale in combination with a single question about social support may be a suitable screening tool for clinical use.

Keywords: Anxiety; Cancer; Depression; Prediction

1. Introduction

The diagnosis of cancer may lead to psychological distress. The most common responses are adjustment problems, with anxiety and depression as the most prevalent [1,2]. The prevalence of depression and anxiety in cancer patients varies greatly among studies, ranging between 0 and 49% [3]. This variation is partly due to the fact that some of the most characteristic somatic features of depression (fatigue, lack of appetite, sleep disturbances) are common among some cancer patients as an effect of their disease and/or treatment but less so among others [4]. Another explanation is that psychological distress varies with the type of cancer and cancer treatment [5]. Thus, results may be comparable between groups only within the same patient population and should not be generalised beyond that. Although most patients' psychological distress decreases over time, 20–30% continue to experience elevated levels of anxiety and depression during follow-up [6–9].

Some studies have demonstrated an increased risk for psychological distress among cancer patients who had experienced depression or anxiety before their diagnosis [10–12]. Several studies have investigated the relationship between social support and psychological distress [4,5,13,14]. In a study by Weisman [15], the following risk factors were identified for elevated levels of depression among cancer patients: social isolation, recent losses, the presence of pain and socio-economic pressures. In a heterogeneous group of 163 cancer patients, Weisman found an increased vulnerability to emotional distress in patients who were generally pessimistic, anticipated little recovery, and who had practically no support from significant others. Bloom and Spiegel [14] found that patients' perceived quality of family support was positively related to their sense of well-being.

Depression appears to be greatly underdiagnosed by primary care physicians [16,17], and even misdiagnosed in some cases [18]. Also, there appears to be a discrepancy between caregivers' ratings of cancer patient

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0959-8049/01/$ - see front matter
PII: S0959-8049(00)00398-1

anxiety and depression and patients' self-ratings [19–22]. Due to the lack of training among non-specialised clinicians and nurses in detecting cancer patients' psychological distress, there is a need for complementary, easily handled diagnostic methods [19,23].

In a previous study of patients ($n=159$) with gastrointestinal cancer [24], we found that anxiety and depression close to the diagnosis explained approximately 35% of the variance in anxiety and depression 6 months later. Additional information on patients' coping strategies at diagnosis slightly improved the prediction. A model was developed using standardised cut-off scores for moderate to high anxiety and/or depression [Hospital Anxiety and Depression (HAD) scale [25], and for intrusiveness of unwanted thoughts and images [Impact of Event (IES) scale [26]. This model achieved a sensitivity of 75% and a specificity of 98% in the identification of patients at risk for prolonged anxiety and/or depression. The model was based on only 14 cases of anxiety and/or depression at 6 months, which is why the results need replication in a larger sample.

The aims of the present study were to investigate the possibility of predicting levels of anxiety and depression 6 months after the cancer diagnosis, and to attempt early identification of individual patients at risk for prolonged distress. It is not necessary, or even desirable, to provide psychological intervention to all patients with moderate or high levels of anxiety and depression at diagnosis, since most patients' psychological distress decreases over time [3]. However, 20–30% continue to experience elevated levels several months after their diagnosis [6–9]. An identification of these patients at diagnosis should facilitate early psychological intervention for this group. The present study is an attempt to test the predictive model of our earlier study [24], in a large, heterogeneous sample of cancer patients, and to explore the importance of some aspects of social support.

2. Patients and methods

2.1. Patients

A population-based consecutive series of newly diagnosed patients with colorectal, gastric, prostate or breast cancer was recruited from the three hospitals in the county of Uppsala, Sweden (population 289,000 in 1995). A total of 41 breast patients who later were found to have a benign disease were included since they did not differ from the breast cancer group with respect to the major outcome measures (anxiety and depression). In accordance with requirements from the local Research Ethics Committee, informed consent was obtained from all patients. Patients were excluded who required constant hospital care (Karnofsky performance status <40), and those who did not speak Swedish or were senile or confused. Patient recruitment started in October 1993 and was terminated in December 1995.

Data on age, gender and diagnosis were compiled from the medical records. Demographic and medical characteristics of the study group are presented in Table 1. Advanced diseases were colorectal and gastric cancer stage IV (inextirpable primary and/or distant metastases), prostate cancer with T-stage 4, lymph node metastases (N_+) or distant metastases (M_1), and breast cancer with locally advanced disease (T3 and T4), >7 positive axillary lymph nodes or distant metastases (M1).

2.2. Study design

Patients who agreed to participate completed the questionnaires as close as possible to their diagnosis and 6 months later. All patients participated in a four-group randomised study of the effectiveness of individual support (psychological support combined with intensified primary care, started at diagnosis) and rehabilitation (group intervention, started 3 months after diagnosis). Thus, group assignment represents a potential confounder in the present analysis, which is why it was included as an independent variable in the univariate regressions and in the logistic regression model. The final model for identification of patients at risk for prolonged psychological distress was tested in each of the four diagnostic groups with similar results. The aim of the present study does not include an evaluation of the effectiveness of the interventions.

2.3. Participation and compliance

Out of 729 eligible patients, 527 (72%) agreed to participate and 202 patients declined. After they were included, it was found that 2 patients did not have cancer (one patient who was diagnosed as a gastric cancer and one as breast cancer), one was not newly diagnosed (prostate), one was suffering from senile dementia (colorectal) and one patient (breast) was not from the county of Uppsala. Thus 522 patients actually participated in the study. Of these 202 patients who declined, 154 patients were not interested in participating [reasons stated by the patients were e.g. 'no need for psychological intervention' ($n=51$), 'don't want to participate in any research project' ($n=22$)], 23 considered the distance to travel for participation too long, 16 regarded themselves as too ill, 7 found participation too time consuming, and 2 had earlier negative experiences of study participation. At 6 months, 415 patients completed the questionnaires. Of those who did not complete the measures at 6 months, 61 declined further

Table 1
Patient characteristics

	Participants at diagnosis (%)	Responders at 6 months (%)
All	522	415
Diagnosis		
Breast	264 (51)	222 (53)
Colorectal	104 (20)	79 (19)
Protate	118 (23)	99 (24)
Gastric	36 (7)	15 (4)
Gender		
Male	205 (39)	154 (37)
Female	317 (61)	261 (63)
Mean age	64 (32–91) years	63 (32–90) years
Non-advanced disease	412 (79)	345 (83)
Advanced disease	110 (21)	70 (17)
Breast	29 (6)	23 (6)
Colorectal	19 (4)	8 (2)
Prostate	40 (8)	33 (8)
Gastric	22 (4)	6 (1)

participation, 25 died before assessment and 26 were missed due to administrative failures.

2.4. Measures

The patients completed questionnaires assessing anxiety and depression, subjective distress and social support, the latter two at diagnosis only.

2.4.1. Anxiety and depression

The Hospital Anxiety and Depression (HAD) scale consists of two subscales, one assessing depression (7 items) and one anxiety (7 items). Subscale scores range from 0 (no distress) to 21 (maximum distress) [25]. In the present predictions of prolonged anxiety and depression, the two subscales are summarised. Zigmond and Snaith [25] suggested a score of 7 or less on either subscale as indicative of a 'non-case', 8–10 as a 'doubtful case' and a score of 11 or more as a 'case'. In the present study, scores of 8 or more on the anxiety and/or depression subscales were considered indicative of a 'case' in the identification of individual patients at risk for prolonged psychological distress

2.4.2. Subjective distress

The Impact of Event Scale (IES) assesses current subjective distress due to a specific life event [26,27], in the present study, the distress of a cancer disease. It is a 15-item scale that measures intrusion (range 0–35), characterised by unbidden thoughts and/or images of the event, and avoidance (range 0–40), characterised by denial of meanings and consequences of the event. The level of distress is considered to be low at a score of 0–8, medium for 9–19, and high for 20 or above [27]. The patient is asked to estimate the frequency of each item during the last week on a four-point scale ranging from 'not at all' to 'often'. The IES was developed to assess intrusion and avoidance, concepts central to the diagnosis of posttraumatic stress disorder (PTSD), as described in the DSM-IV [28].

2.4.3. Social support

An instrument was constructed for the study including a total of 10 items assessing social support (Appendix). Seven items (1–7) were selected from the ISSI, a 50-item interview schedule for the assessment of the availability and perceived adequacy of a wide range of social contacts and relationships [29]. A short version of the interview schedule has been examined for reliability, validity and predictive capacity in a study by Undén and coworkers [30]. The short-form version yields two scales, one describing availability of emotional relationships or 'attachment', including the 7 items used in the present study. The remaining 3 items were selected from 'The Gothenburg Quality of Life Instrument' [31]. A principal component factor analysis (varimax rotation) including the 10 items demonstrated two factors (item-factor correlations >0.40). Factor 1 (items 1–7), accounted for 32%, and Factor 2 (items 8–10) for 19% of the variance. Factor 1 (score range 7–14) was named 'Attachment' and Factor 2 (score range 3–21) 'Satisfaction'. For both factors, a high score indicates more social support.

2.5. Statistical analysis

The X^2-test was used for group comparisons of category variables. Comparisons of group means (advanced vs non-advanced disease, case vs non-case of anxiety and/or depression etc.) were performed by unpaired *t*-tests. Repeated-measures ANOVAs were used for comparisons involving more than two groups (e.g. diagnoses) and to assess changes over time. The Fisher PLSD was used for *post hoc* comparison. Stepwise regression analyses were performed to determine how much of the variance in anxiety and depression at 6 months was explained by anxiety and depression, subjective distress and social support close to the diagnosis. Social support was represented both as the two factors and as the 10 separate items. The extent of correct/incorrect identification of patients with moderate (doubtful cases) or high levels (cases) of 6-month anxiety and depression was assessed in terms of sensitivity and specificity. Sensitivity expresses the correct proportion of identified cases (number of true positives/number of true positives plus number of false negatives), and specificity is the proportion of correctly identified non-cases (number of true negatives/number of true negatives plus number of false positives). Logistic regression models were used to test independent variables for their

risk factor status. Maximum likelihood estimators were calculated as measures of association between variables (risk factors) at diagnosis and moderate or high levels of anxiety and depression at 6 months. The results are presented as odds ratios (OR) with 95% confidence intervals (95% CI). The independent variables included in the multivariate analysis were selected by univariate analyses (significant variables were included), and on the basis of results from earlier studies showing them to be important in the prediction of anxiety and depression [24]. The independent variables were eliminated one at a time and the new model was compared to the earlier one by a likelihood ratio test. In the final model, only significant variables were kept.

3. Results

The mean scores of HAD anxiety and depression at diagnosis and at the 6-month follow-up, and the number of patients scoring as doubtful cases/cases on the HAD scale are presented in Table 2. Mean levels of anxiety and depression decreased significantly over time for the whole group and anxiety did so also for all diagnostic groups, but not for depression in patients with gastric or prostate cancer. At diagnosis, patients with breast cancer reported significantly higher levels of anxiety than patients with colorectal or prostate cancer [$F = 4.62$, (3, 478) $P < 0.005$] whereas no significant differences were seen after 6 months. Patients with advanced disease (total sample) reported significantly higher levels than those with non-advanced disease for depression [Baseline: $t = 2.96(480)$, $P < 0.001$, 6 months: $t = 3.48$ (413), $P < 0.001$] but not for anxiety (Table 2).

Mean scores for IES intrusion and avoidance, and for the social support subscales 'Attachment' and 'Satisfaction' at diagnosis are presented in Table 3. At baseline, breast cancer patients reported significantly higher levels of intrusion than did patients with colorectal or prostate cancer [F (3, 491) $= 14.94$, $P < 0.001$)]. There were no further significant differences between diagnoses or between groups with advanced and non-advanced disease for IES intrusion and avoidance, or for social support.

3.1. Prediction of anxiety and depression 6 months after diagnosis

In order to illustrate the applicability of the results at an individual level, they will be presented not only in terms of the proportions of explained variance in anxiety and depression 6 months after diagnosis, but also in terms of separate risk factors (for possible use in clinical assessment), and in terms of the extent of correct/incorrect identification of patients at risk for prolonged anxiety and depression.

Table 2
Mean scores and the number of patients (% of responders) categorised as doubtful cases or cases on the Hospital Anxiety and Depression (HAD) scale at diagnosis and at 6-months follow-up for the various diagnoses and for non-advanced versus advanced cancer disease groups[a]

	HAD anxiety[b]					HAD depression[b]				
	Diagnosis		6 Months			Diagnosis		6 Months		
(*n*)	Mean score	Doubtful cases	Mean score	Doubtful cases	*P* value	Mean score	Doubtful cases	Mean score	Doubtful cases	*P* value
All (522/415)	5.3	120 (23%)	3.6	65 (16%)	0.001	4.3	76 (15%)	3.3	45 (11%)	0.001
Non-advanced (412/345)	4.8	87 (21%)	3.5	53 (15%)	0.001	**3.5**	55 (13%)	**2.6**	27 (8%)	ns
Advanced (102/70)	5.7	33 (32%)	3.8	12 (17%)	0.001	**5.0**	21 (21%)	**4.0**	18 (26%)	0.01
Breast (264/222)	6.0	73 (28%)	4.0	40 (18%)	0.001	3.8	40 (15%)	3.2	21 (9%)	0.001
Non-advanced (235/199)	5.5	64 (27%)	3.8	34 (17%)	0.001	3.4	36 (15%)	**2.4**	15 (8%)	0.01
Advanced (29/23)	6.6	6 (21%)	4.1	6 (26%)	0.05	4.1	4 (14%)	**4.2**	6 (26%)	ns
Colorectal (104/79)	4.8	22 (21%)	3.3	9 (11%)	0.001	4.7	14 (13%)	3.5	6 (8%)	0.001
Non-advanced (85/71)	4.1	15 (18%)	2.6	8 (11%)	0.001	3.9	10 (12%)	2.6	3 (4%)	0.001
Advanced (19/8)	5.4	7 (37%)	4.0	1 (13%)	ns	5.4	4 (21%)	4.4	3 (38%)	ns
Gastric (36/15)	5.6	11 (31%)	4.0	2 (13%)	0.01	5.1	8 (22%)	4.4	2 (13%)	ns
Non-advanced (14/9)	3.5	1 (5%)	3.2	1 (11%)	ns	**3.4**	1 (5%)	3.3	0	ns
Advanced (22/6)	7.4	10 (71%)	4.8	1 (17%)	ns	**6.8**	7 (50%)	5.5	2 (33%)	ns
Prostate (118/99)	4.0	14 (12%)	3.4	14 (14%)	0.05	3.9	14 (12%)	3.3	16 (16%)	ns
Non-advanced (78/66)	3.7	7 (9%)	3.4	10 (15%)	ns	**3.2**	8 (10%)	3.0	9 (14%)	ns
Advanced (40/33)	4.4	7 (18%)	3.3	4 (12%)	ns	**4.6**	6 (15%)	3.6	7 (12%)	0.05

ns, non significant.

[a] See Table 1 for numbers of participants at diagnosis and responders at 6 months.

[b] Bold values indicate significant differences between non-advanced and advanced subgroups.

Table 3
Mean scores [Impact of Event Scale (IES) and the Social support scale] for the various diagnoses and for non-advanced versus advanced groups

	IES		Social support	
(*n*)	Intrusion Mean score	Avoidance Mean score	'Attachment' Mean score	'Satisfaction' Mean score
All (522)	12.1	14.6	13.5	18.2
Non-advanced (412)	12.2	14.1	13.3	18.1
Advanced (110)	12.0	15.2	13.6	18.4
Breast (264)	14.4	13.7	13.5	18.1
Non-advanced (235)	14.4	14.1	13.4	17.9
Advanced (29)	14.3	13.4	13.7	18.2
Colorectal (104)	10.0	14.8	13.2	18.2
Non-advanced (85)	8.9	13.0	13.2	18.1
Advanced (19)	11.2	16.5	13.2	18.4
Gastric (36)	11.9	13.6	13.8	18.3
Non-advanced (14)	10.8	11.3	13.7	18.4
Advanced (22)	13.1	15.9	14.0	18.3
Prostate (118)	9.6	14.2	13.2	18.3
Non-advanced (78)	9.1	12.9	13.0	18.3
Advanced (40)	10.2	15.6	13.4	18.4

3.1.1. Stepwise regression

Analyses including the independent variables (at diagnosis) anxiety and depression, intrusion, avoidance and social support ('Attachment' and 'Satisfaction') revealed that 39% of the variance was accounted for by anxiety and depression, an additional 2% by intrusion and an additional 2% by 'Satisfaction' (Table 4). Group assignment (in the randomised study) was not significantly associated with the dependent variable ($\beta = 0.01$, $SE(\beta) = 0.2$, $t = 0.4$).

A stepwise regression analysis including only the social support factors as independent variables indicated that 'Satisfaction' accounted for 6% of the variance in anxiety and depression at 6 months. When including separate items of social support, item 6 accounted for 5% and item 10 for an additional 2% of the variance (Table 4).

Table 4
Prediction of anxiety and depression 6 months after diagnosis on the basis of anxiety and depression, subjective distress and social support close to the diagnosis

	R^2	β	SE(β)	*t*
Anxiety and depression at 6 months				
Anxiety/depression	0.39	0.41	0.04	9.9*
Intrusion	0.41	0.13	0.04	3.2†
'Satisfaction'	0.43	0.22	0.09	2.4‡
Only social support				
Anxiety and depression at 6 months				
'Satisfaction'	0.06	0.45	0.12	3.9†
Separate items of social support				
Anxiety and depression at 6 months				
Item 6	0.05	0.76	0.34	2.2‡
Item 10	0.07	3.1	1.0	3.2†

* = $P < 0.001$. † = $P < 0.01$. ‡ = $P < 0.05$.

3.1.2. Logistic regression

Several of the variables were significantly associated with the outcome measure in univariate logistic regression (Table 5). Patients who scored as doubtful cases/ cases for HAD anxiety and/or depression close to the diagnosis were 11 times more likely than those who did not score as cases to score as cases at 6 months (OR 11.2, 95% CI, 6.3–20.1). Patients who felt there was no special person giving them real support (Item 1, OR: 3.8, CI: 1.4–9.9), those who did not know a special person with whom they could share their feelings (Item 3, OR: 2.9, CI: 1.3–6.6), and those who had nobody besides their family whom they could rely on in case of difficulties (Item 6, OR 2.5, CI: 1.3–4.6) were also more likely to score as doubtful cases/ cases for anxiety and/ or depression at 6 months. Group assignment (in the randomised study), age, gender, marital status or income were not significantly associated with the dependent variable (data not shown).

A multivariate analysis, including all significant risk factors from the univariate analyses and risk factors selected on the basis of earlier research, resulted in a final model (Table 5). Scoring as a doubtful case/case for HAD anxiety and/or depression was the strongest predictor. These patients were above 11 times more likely to score as doubtful cases/cases at 6 months. Having an advanced disease and nobody in addition to their family to rely on in case of difficulties (Item 6), were additional independent risk factors.

Table 5
Univariate and multivariate analyses (logistic regression) of anxiety, depression, and social support at diagnosis as predictors of levels of anxiety and/or depression 6 months after diagnosis[c]

Variable	Odds ratio (OR)	95% CI[a]
Univariate analyses		
HAD 'doubtful cases' or 'cases': Yes versus No	11.2	6.3–20.1
Advanced versus non-advanced disease	2.4	1.3–4.2
Social support.: No versus Yes		
Item 1:[b]	3.8	1.4–9.9
Item 2:	1.7	0.9–3.3
Item 3:	2.9	1.3–6.6
Item 4:	2.3	1.1–4.9
Item 5:	2.0	1.0–4.0
Item 6	2.5	1.3–6.6
Item 7	1.7	0.9–3.3
Item 8	1.5	1.2–1.8
Item 9	1.3	1.1–1.5
Item 10	1.4	1.1–1.7
Multivariate analyses		
HAD 'doubtful cases' or 'cases': Yes versus No	11.5	6.3–20.1
Social support, item 6: No versus Yes	2.7	1.3–5.3
Advanced versus non-advanced disease	3.2	1.6–6.6

[a] Confidence interval.
[b] See Appendix for a description of items.
[c] No. of cases in the logistic regression analyses = 399–413.

3.2. Prospective identification of anxiety and/or depression cases

Utilisation of two criteria: 1. 'doubtful case' or 'case' of HAD anxiety and/or depression close to the diagnosis and/or 2. Not having anybody to rely on in case of difficulties, for identification of patients in need of psychological interventions, gives a sensitivity of 80% and a specificity of 73% (Table 6, Model 3). Addition of data on scores above a cut-off of 9 (medium to high subjective distress) for IES intrusion [24] resulted in an extremely high sensitivity (99%) but at the cost of a marked loss of specificity (38%) (data not shown). Model 3 was tested among control patients only, yielding similar values of sensitivity and specificity (80 and 74%), as well as in the benign breast cancer group (80 and 82%), and separately for breast cancer patients (79 and 74%) and remaining diagnoses (82 and 73%). The model achieved higher levels of sensitivity and specificity among the sample with a non-advanced disease (84 and 75%) than among patients with an advanced disease (71 and 67%). As is illustrated in Table 6 (Model 3) a model based on HAD 'doubtful cases'/'cases' and/or the mentioned social item slightly increased sensitivity and reduced specificity as compared to using HAD data only (Table 6, Model 1) or a combination of HAD and IES data (Table 6, Model 2).

4. Discussion

The levels of anxiety and depression at diagnosis were the best predictors of anxiety and depression 6 months later. In the multiple logistic regression analysis, the only significant risk factors (at diagnosis), except anxiety and depression, were advanced disease and a lack of somebody besides the family to rely on in case of difficulties. Advanced disease being a risk factor was an expected finding since several studies have found the prevalence of depression to be substantially higher as the severity of medical illness increases [32,33]. Also, studies of the prevalence of depression in cancer patients have confirmed this conclusion [34–36].

Agreement with the single item (Item 6) of social support, 'nobody in addition to your family to rely on in case of difficulties' was a significant risk factor. The family is usually heavily involved in the disease, sometimes as much victims as the patient. Studies have shown that spouses and family members experience both mental and physical health changes during illness

Table 6
Number of patients who scored as 'doubtful cases' or 'cases' for HAD anxiety or depression after 6 months related to how they scored at diagnosis using the HAD scale alone (model 1) or the HAD scale supplemented by IES intrusion (model 2)

Model		Scoring at diagnosis	HAD 'doubtful cases' or 'cases' after 6 months	
			Yes	No
1. HAD 'doubtful cases' or 'cases'	Yes	110	52	59
Sensitivity 71%	No	294	21	273
Specificity 82%				
2. HAD 'doubtful cases' or 'cases' and above	Yes	102	48	54
cut-off for IES intrusion	No	303	24	279
Sensitivity 67%				
Specificity 84%				
3. HAD 'doubtful cases' or 'cases' and/or item 6	Yes	144	57	87
Sensitivity 80%	No	254	14	240
Specificity 73%				

in the family ([37] for a review), and that spouses report greater psychological distress than do the patients [38]. Having somebody outside the family to rely on may, therefore, be beneficial. In a recent review by Helgeson and Cohen [39] of the relationship between social support and adjustment to cancer, three main types of social support were identified: (1) emotional support involving verbal and non-verbal communication of concern, (2) informational support concerned with information and advice, and (3) instrumental support involving the provision of material goods, e.g. money. Emotional support was identified by the patients as the most helpful, regardless of what person was involved. Informational support by health care professionals was identified as helpful, but such support from family and friends was unhelpful. In a group of 79 breast and colorectal cancer patients, emotional support was identified as helpful most often, and instrumental support as helpful least often [40]. The present study investigated emotional support and instrumental support and verified that poor emotional support outside the family is a risk factor for anxiety and depression.

A past history of major depressive disorder has been shown in some studies to be an important factor associated with vulnerability to depression during the course of a cancer [41,42]. In the present study, no information was available about patients' past history of depressive disorder. Research on patients with a diagnosis of major depression has demonstrated that between the depression periods, there are no differences between depression-prone individuals and others with respect to cognitive distortions and emotional reactions. The differences emerge only in connection with stressful events [43]. A cancer diagnosis could be considered a stressful event and, consequently, patients with a past history of depression may react with higher levels of depression. This aspect should be investigated to identify patients at risk of prolonged anxiety and depression. When data on anxiety and depression are used for prediction, they should be gathered in response to a stressful event (e.g. the diagnosis) that could be assumed to trigger such reactions. It is likely that inappropriate points of assessment may result in less successful predictions and, consequently, unnecessarily missed future cases of anxiety and depression.

In our previous study [24], scores above a cut-off of 7 of HAD anxiety and/or depression together with scores above a cut-off of 9 of IES intrusion identified patients with prolonged anxiety and depression with a sensitivity of 75% and a specificity of 98%. Somewhat lower levels were reached in the present study (67 and 84%). The best model in the present study used cut-off scores of HAD and the social item "having someone besides the family to rely on in difficult situations" (item 6). Increasing sensitivity mostly means reducing specificity. Clinically, high sensitivity is of great importance but not at the cost of a low specificity since this would lead to over-treatment and too high costs in relation to benefits. This would, for example, be the case if HAD + IES intrusion + item 6 were used for prediction (99 and 38%). The final model proposed here was tested in different subsamples, i.e. the four diagnostic groups, advanced as well as non-advanced disease groups, and the benign breast cancer group and found to be stable across all subgroups. The model is easily handled and could thus be useful for selection of patients in need of psychosocial support. The results demonstrate that HAD doubtful cases/cases and/or item 6 constitutes the best model for identification of patients in need of psychological support. This means that item 6 alone possesses considerable predictive power. To reduce time and administrative clinical burden, it is, therefore, suggested that only those patients who do have someone to rely on outside the family need to be asked to complete the HAD scale.

In order to assess the impact of patient drop-out on external validity, comparisons were performed between responders and non-responders at 6 months. With one expectation, the baseline mean scores of those patients who failed to complete the questionnaires at 6 months did not differ significantly from those who participated throughout the study: the mean value of depression ($m = 4.6$ vs $m = 3.6$, $t = 2.2$. $P < 0.05$). No differences were found in the number of patients scoring as doubtful cases/cases for HAD anxiety or depression. Thus, it is unlikely that the absence of data on the non-responders jeopardises the generalisability of the findings.

39% of the variance in depression/anxiety at 6 months was explained by data on these variables at inclusion. In addition, the above mentioned social factor and stage of disease explained additional variance. Still, there is a considerable amount of unexplained variance that could be due to a former history of depression, or other stressful events occurring between diagnosis and 6 months, e.g. the appearance of metastases, pain, deterioration of physical, social and role functions, retirement, death or illness of spouse, divorce, etc.

In conclusion, levels of anxiety and depression at diagnosis predict a similar status 6 months later. Having an advanced disease and/or nobody besides the family to rely on in case of difficulties are additional risk factors. The proposed model, based on the HAD and a single question about social support is suggested as suitable for clinical use. Data on the patient's history of anxiety and depression should be gathered in future studies in order to increase the accuracy of predictions.

Acknowledgement

This research was made possible by a grant from the Swedish Cancer Society.

Appendix. Questions of social support

		Yes	No
1.	Do you feel there is a special person giving you real support?	_	_
2.	Do you think there is a special person feeling very close to you?	_	_
3.	Do you know a special person with whom you can share your feelings of happiness? Someone who would feel happy just because you are?	_	_
4.	Do you know someone with whom you can share your inner feelings and entrust yourself to?	_	_
5.	Does someone now and then console or support you by holding you tight?	_	_
6.	Is there anyone in addition to your family, whom you could rely on in case of difficulties? Someone that you easily could get hold of and trust and could get real help from when you have problems.	_	_
7.	Is there anyone around who you could easily ask for things? For example persons whom you know well enough to borrow tools or kitchen utensils from.	_	_

How satisfied were you with your life in the following respects before your tumour disease was detected.

		Not at all						Very much
8.	Your place	1	2	3	4	5	6	7
9.	Your economy	1	2	3	4	5	6	7
10.	Your home and family situation	1	2	3	4	5	6	7

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