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The utility of the Edmonton Symptom Assessment System in screening for anxiety and depression

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The utility of the Edmonton Symptom Assessment System in screening for anxiety and depression

The Edmonton Symptom Assessment System (ESAS) is a common screening tool in cancer, although its validity for distress screening is unproven. Here, screening performance of the ESAS anxiety (ESAS-A) and depression (ESAS-D) items were validated against the anxiety [Generalised Anxiety Disorder-7 (GAD-7)] and depression [Patient Health Questionnaire-9 (PHQ-9)] subscales of the PHQ. A total of 1215 cancer patients completed the Distress Assessment and Response Tool (DART), a computerised distress screening instrument. Spearman's rank correlation coefficients and receiver operating characteristic curve analyses were used to evaluate the ability of ESAS-A and ESAS-D to identify moderate distress (GAD-7/PHQ-9 $\geq$ 10). Spearman's rank correlation coefficients comparing ESAS-A and ESAS-D with GAD-7 and PHQ-9 were 0.74 and 0.72 respectively. Areas under the receiver operating characteristic curves were 0.89 and 0.88 for anxiety and depression respectively. A cut-off of $\geq$3 on ESAS-A demonstrated a sensitivity of 0.91, specificity of 0.68, positive predictive value of 0.34 and negative predictive value of 0.97. A cut-off of $\geq$2 on the ESAS-D demonstrated a sensitivity of 0.86, specificity of 0.72, positive predictive value of 0.46 and negative predictive value of 0.95. High sensitivities of ESAS-A and ESAS-D at certain cut-offs suggest they have use in ruling-out distress. However, their low specificities indicate secondary screening is needed to rule-in anxiety or depression for case-finding.

Keywords: Edmonton Symptom Assessment System, PHQ-9, GAD-7, anxiety, depression, distress screening.

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INTRODUCTION

Cancer is associated with significant symptoms of depression and anxiety in approximately 10% and 18% of patients respectively (Stark *et al*. 2002; Ng *et al*. 2011), which may contribute to poorer quality of life, less patient satisfaction with care and treatment adherence, and increased health care consumption (Prieto *et al*. 2002; Stark *et al*. 2002; Ell *et al*. 2005). However, lack of enquiry by oncology clinicians, coupled with the hesitancy of patients to discuss emotional difficulties with physicians (Sankar & Jones 2005) means that emotional distress often goes unrecognised in many North American and European contexts (Fallowfield *et al*. 2001; Sollner *et al*. 2001; Fritzsche *et al*. 2004; Keller *et al*. 2004). Despite low rates of distress detection in clinical settings, only 14% of American oncologists (Pirl *et al*. 2007), 10% of British cancer specialists (Mitchell *et al*. 2008) and 36% of Canadian cancer care facilities (Vodermaier & Linden 2008) use standardised distress screening tools to improve detection.

Emotional distress is internationally recognised as the 6th Vital Sign (Bultz & Johansen 2011). The guidelines of many national cancer control agencies, including the National Comprehensive Cancer Network in the USA, the Canadian Strategy for Cancer Control, the National Institute for Health and Clinical Excellence in the UK and the Australian National Cancer Control Initiative include recommendations for standardised distress screening. Various tools to screen for emotional distress are currently used internationally, including the Hospital Anxiety and Depression Scale (HADS) (Ibbotson *et al*. 1994; Pascoe *et al*. 2000; Strong *et al*. 2007), the Patient Health Questionnaire-9 (PHQ-9) (Thekkumpurath *et al*. 2011), the Brief Symptom Inventory (Zabora *et al*. 2001), the Screening Inventory of Psychosocial Problems (Braeken *et al*. 2011), the European Organization for Research and Treatment of Cancer Quality of Life Questionnaire-Core 30 (Detmar *et al*. 2002; Velikova *et al*. 2004) and the Distress Thermometer (DT) (Tuinman *et al*. 2008; Lynch *et al*. 2010; Bidstrup *et al*. 2012). However, there is no consensus on the most efficient and practical means to screen for emotional distress (Mitchell *et al*. 2008).

Ultra-brief screening tools have the potential to minimise patient and clinic burden, but may lack specificity (Vodermaier *et al*. 2009). The DT, which consists of a single distress scale with responses ranging from 0 to 10, is a widely used screening tool developed in the USA and gaining use in Europe. The DT has been repeatedly validated against the HADS, the Brief Symptom Inventory and the PHQ-9. Although highly acceptable to medical teams, poor specificity has resulted in controversy regarding the optimal cut-off score to use on the DT, with recommended cut-offs ranging from 2vs3 (Bidstrup *et al*. 2012), 4vs5 (Gessler *et al*. 2008) or 7 (Hegel *et al*. 2008).

The Edmonton Symptom Assessment System (ESAS) (Bruera *et al*. 1991) was originally developed in 1991 for use in palliative oncology care and has recently been validated for use in non-palliative oncology (Watanabe *et al*. 2011). It consists of nine single Likert scale items, including one for current anxiety (ESAS-A) and one for current depression (ESAS-D) (Bruera *et al*. 1991). The ESAS is increasingly being used globally in cancer care and has been translated into 33 languages, including Italian (Moro *et al*. 2006), German (Stiel *et al*. 2010), Spanish (Carvajal *et al*. 2011) and Thai (Chinda *et al*. 2011). It is particularly advantageous for cancer settings as it allows for quick evaluation of the multiple physical and mood symptoms that may burden oncology patients. The ESAS-A and ESAS-D have been widely used as ultra-brief screening tools for anxiety and depression (Howell & Olsen 2011), but concerns have been raised about the tool's psychometric properties and there is a lack of agreement on which cut-off scores should be used in screening for emotional disorders (Richardson & Jones 2009).

Despite its widespread uptake, there is little validation research published on the emotional distress domains of the ESAS (Watanabe *et al*. 2011). The HADS is the only specific anxiety or depression measure to which the ESAS has been compared, with several studies demonstrating only a modest to poor correlation (Vignaroli *et al*. 2006; Teunissen *et al*. 2007; Delgado-Guay *et al*. 2009; Noguera *et al*. 2009). Spearman's correlations between ESAS and HADS have been reported at 0.56 for anxiety and 0.39 for depression (Delgado-Guay *et al*. 2009). The weakness of these correlations may be related to the psychometric properties of the HADS in cancer populations (Mitchell *et al*. 2010; Carey *et al*. 2012). The HADS anxiety and depression subscales are highly inter-related, leading to uncertainty about their scoring (Mitchell *et al*. 2010; Carey *et al*. 2012). The ESAS has also been compared to the DT in a small study of 50 patients (Steinberg *et al*. 2009). A modest Pearson correlation of 0.46 was reported between the DT and the total ESAS score, with the ESAS depression and nervousness questions being the most significant predictors of the DT score.

To assess the utility of the ESAS for emotional distress screening, we evaluated the performance of ESAS-A and ESAS-D items, validated against the anxiety [Generalised Anxiety Disorder-7 (GAD-7)] and depression (PHQ-9) subscales of the PHQ as criterion standards in a cohort of oncology outpatients.

METHODS

Data collection

Princess Margaret Hospital, a tertiary care facility for cancer care and research in Toronto, Canada has developed the Distress Assessment and Response Tool (DART), a comprehensive, standardised distress screening programme. DART is a self-administered computerised survey including screens for physical symptoms (ESAS), anxiety (GAD-7), and depression (PHQ-9). Patients complete DART as part of routine clinical care throughout their cancer trajectory and are linked to interventions from an inter-disciplinary care team.

Measures

The ESAS consists of nine items, each rated on a 0–10 Likert scale, including pain, tiredness, nausea, depression, anxiety, drowsiness, appetite, feeling of wellbeing and shortness of breath (Bruera *et al*. 1991). Validity evidence for interpreting ESAS scores and linking them to clinical response is lacking (Richardson & Jones 2009).

The GAD-7 and PHQ-9 are subscales of the PHQ, a patient self-report version of the Primary Care Evaluation of Mental Disorders, a widely used screening tool for mental health disorders in primary care (Spitzer *et al*. 1999). A score of ≥10 on the GAD-7 and PHQ-9 is recommended by the developers as a cut-off score to trigger further diagnostic assessment. The PHQ-9 is a nine-item scale measuring Diagnostic & Statistical Manual of Mental Disorders, Fourth Edition concordant depression, with responses to questions ranging from 0–3. In the Thekkumpurath study of 4264 cancer outpatients (Thekkumpurath *et al*. 2011), a cut-off of 10 provided an 82% sensitivity, with a higher 88% specificity and positive predictive value (PPV) of 32%, compared to their suggested cut-off of 8 (93% sensitivity, 81% specificity, 25% PPV). The developer's recommended cut-off scores on the PHQ-9 for mild, moderate and severe depression are ≥5, ≥10 and ≥15 respectively (Kroenke *et al*. 2001).

Anxiety in cancer may be most closely related to the free floating anxiety characteristic of GAD (Li *et al*. 2011). The GAD-7 was originally developed as a screen for GAD, and is frequently used in conjunction with the PHQ-9 (Kroenke *et al*. 2010). It is a seven-item scale, with responses scored from 0–3 and cut-off scores of ≥5, ≥10 and ≥15 representing mild, moderate and severe anxiety respectively (Spitzer *et al*. 2006). At a cut-off of 10, the GAD-7 has a sensitivity and specificity of 89% and 82% for generalised anxiety disorder, 74% and 81% for panic disorder and 66% and 81% for post-traumatic stress disorder in medical and primary care populations (Spitzer *et al*. 2006). The GAD-7 has recently been validated against more widely used anxiety measures such as the Penn State Worry Questionnaire (Dear *et al*. 2011) and is gaining use due to its brevity and good psychometric properties in screening for a range of anxiety disorders.

Subjects

Between 26 October 2009 and 28 October 2010, 1376 patients with all stages of cancer completed DART at least once in six oncology clinics (psychosocial oncology, endocrine, gynaecology, lung, melanoma and sarcoma). A total of 1223 patients provided informed consent for their data to be used for research (11% refusal rate), and from these, eight patients were excluded because of incomplete information. As such, data from 1215 patients were used for this study. All patients were ≥18 years old and completed DART in English. Demographic and tumour-specific information was extracted from chart reviews. The study protocol was approved by the institutional research ethics board.

Statistical analyses

Exploratory analyses of the distribution of scores for ESAS-A, ESAS-D, GAD-7 and PHQ-9 were conducted. Scatterplots and Spearman's rank correlation coefficients were used to assess the relationship between ESAS-A and ESAS-D, against the summed scores of the GAD-7 and PHQ-9 respectively. The sensitivity, specificity, PPV and negative predictive value (NPV) were calculated at each point (0–10) for ESAS-A and ESAS-D. Receiver operating characteristic (ROC) analyses were used to examine the ability of ESAS-A and ESAS-D to detect cases defined categorically by using cut-offs of ≥10 on GAD-7 and PHQ-9 as the criterion standards for identifying moderate anxiety and depression. Areas under the ROC curves (AUC) values were determined to assess overall screening performance of ESAS-A and ESAS-D, with an AUC of 0.5 representing discrimination no better than chance (curve falls on the diagonal line), and an AUC of 1.0 representing perfect discrimination between cases and non-cases.

Theoretically, the ideal cut-off point on an ROC curve lies at the shortest distance from the perfect marker [i.e. a predictor with 100% specificity and 100% sensitivity lies closest to the upper left hand corner (0, 1)] and the furthest distance from the non-informative diagonal line (i.e. Youden's J index: sensitivity + specificity – 1). In practice, a chosen cut-off point will rarely have 100% sensitivity and 100% specificity; hence cut-offs are selected depend-

ing on whether the goal is screening (higher sensitivity and NPV) or case-finding (higher specificity and PPV). Sensitivity and specificity are measures of occurrence, while PPV and NPV are measures of discrimination. To be clinically useful, a test should score high on both occurrence and discrimination, a calculation expressed as the utility index. A positive utility index (UI+: sensitivity × PPV) is the rule-in or case-finding accuracy, whereas a negative utility index (UI–: specificity × NPV) is the rule-out or screening accuracy. UI < 0.2 is considered poor; 0.2 to 0.4 fair; 0.4–0.6 moderate; 0.6 to 0.8 good; and >0.8 excellent. All statistical analyses were performed using the SAS™ statistical software package, release 9.2 (SAS Institute, Cary, NC, USA).

Bayes' theorem principles were used to account for variations in prevalence of anxiety and depression. Bayesian calculations integrate pre-test probability of disease with likelihood ratios to provide information about post-test probability of disease (Maceneaney & Malone 2000). The resultant post-test probability is an individualised PPV or NPV based on the prevalence of anxiety/depression in the population under consideration. Bayesian conditional probability plots were constructed by comparing cut-off points of ESAS-A and ESAS-D with GAD-7 and PHQ-9. These plots provide information about the rule-in/rule-out gain of the chosen cut-off point, independent of the prevalence of distress in the patient sample.

Table 1. Demographic and clinical data of 1215 mixed cancer patients

Variable	No. of patients (%)
Age (years)	Mean, 55; SD, 16.1
Gender	
Male	540 (44%)
Female	675 (56%)
Social support	
Married	751 (62%)
Living alone	217 (18%)
Cancer site	
Psychosocial oncology	226 (19%)
Endocrine	192 (16%)
Gynaecology	132 (11%)
Lung	20 (2%)
Melanoma	393 (32%)
Sarcoma	252 (21%)

RESULTS

The mean age of the patients was 55 years (SD, 16.1) and the cohort was comprised of 44% men and 56% women. Demographic data and distribution of cancer types are shown in Table 1, and prevalence of anxiety and depression based on GAD-7 and PHQ-9 are in Table 2. Overall, based on the recommended cut-off scores for GAD-7 and PHQ-9, 35.4%, 15.7% and 7.2% of patients experienced, mild, moderate and severe anxiety respectively; and 42.6%, 21.6% and 9.4% of patients experienced mild, moderate and severe depression respectively.

The mean ESAS-A score was 2.61 (SD, 2.92) and the mean GAD-7 score was 4.33 (SD, 5.29). Spearman's rank correlation coefficient for ESAS-A versus the summed score for GAD-7 was 0.74 ($P < 0.0001$). The mean ESAS-A score was higher for patients with anxiety than without anxiety (6.62 vs. 1.86, $P < 0.0001$).

The mean ESAS-D score was 2.03 (SD, 2.77) and the mean PHQ-9 score was 5.32 (SD, 5.87). Spearman's rank correlation coefficient for ESAS-D versus the summed score for PHQ-9 was 0.72 ($P < 0.0001$). The mean ESAS-D score was higher for depressed patients than for non-depressed patients (5.34 vs. 1.13, $P < 0.0001$).

With ROC analyses, AUC scores indicating good discriminating power and predictive accuracy between cases and non-cases were found for ESAS-A (compared to GAD-7): 0.89 (95% CI 0.87–0.92) and for ESAS-D (compared to PHQ-9): 0. 88 (95% CI 0.86–0.90) (Figs 1 and 2). Threshold analyses for the ROC curves are presented in Tables 3 and 4. On the basis of the ROC curve for anxiety (Fig. 1), a

Table 2. Anxiety and depression rates: overall and by oncology clinic type for 1215 mixed cancer patients

		Overall		Psychosocial		Endocrine		Gynaecology		Lung		Melanoma		Sarcoma	
		n = 1215		*n* = 226		*n* = 192		*n* = 132		*n* = 20		*n* = 393		*n* = 252	
Outcome	Summed score	*n*	%	*n*	%	*n*	%	*n*	%	*n*	%	*n*	%	*n*	%
Depression															
Mild	PHQ ≥ 5	517	42.6	192	85.0	84	43.8	48	36.4	7	35.0	113	28.8	73	26.2
Moderate	PHQ ≥ 10	262	21.6	124	54.9	34	17.7	26	19.7	3	15.0	42	10.7	33	11.8
Severe	PHQ ≥ 15	114	9.4	60	26.5	14	7.3	13	9.8	0	0.0	13	3.3	14	5.0
Anxiety															
Mild	GAD ≥ 5	430	35.4	156	69.0	67	34.9	42	31.8	8	40.0	87	22.1	70	25.1
Moderate	GAD ≥ 10	191	15.7	97	42.9	20	10.4	21	15.9	3	15.0	26	6.6	24	8.6
Severe	GAD ≥ 15	87	7.2	44	19.5	10	5.2	10	7.6	0	0.0	12	3.1	11	3.9

PHQ, Patient Health Questionnaire; GAD, Generalised Anxiety Disorder.

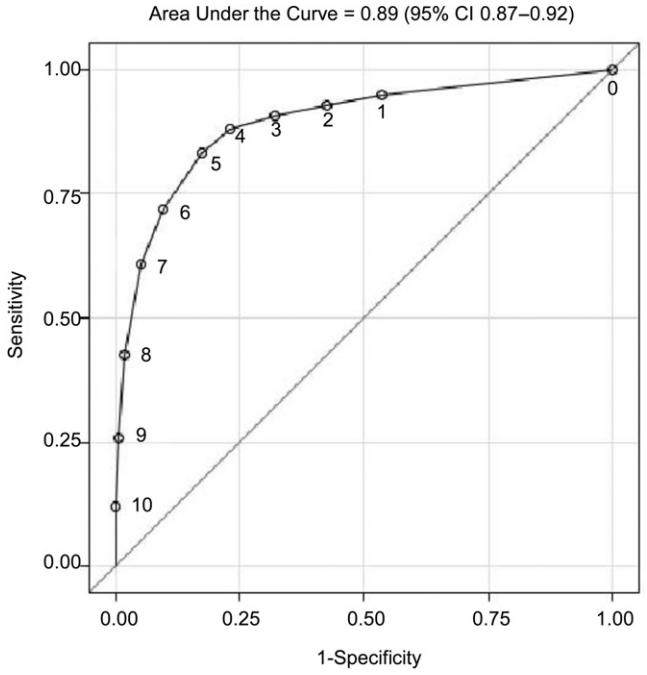

Figure 1. Receiver operating characteristic curve of Edmonton Symptom Assessment System anxiety scores against Generalised Anxiety Disorder-7 scores. Labelled points are Edmonton Symptom Assessment System anxiety scores.

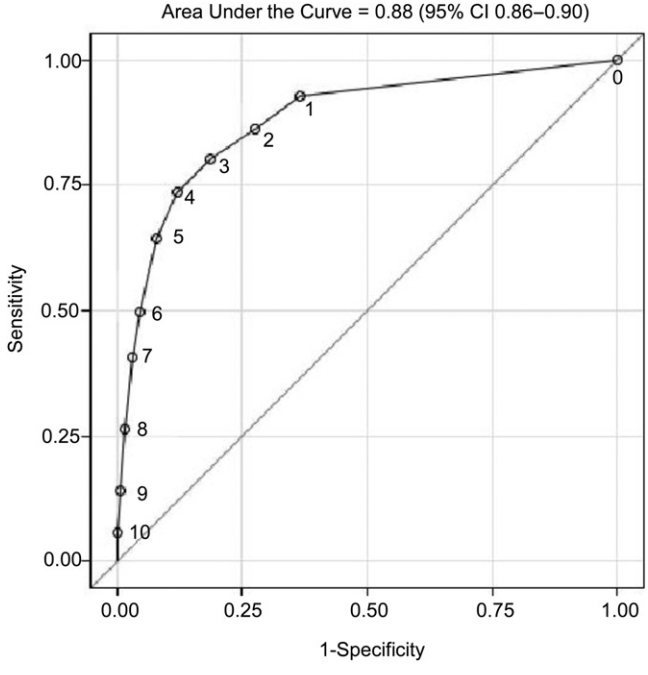

Figure 2. Receiver operating characteristic curve of Edmonton Symptom Assessment System depression scores against Patient Health Questionnaire-9 scores. Labelled points are Edmonton Symptom Assessment System depression scores.

Table 3. Accuracy measures for ESAS-A scores against GAD-7 (score ≥ 10) for 1215 mixed cancer patients

ESAS anxiety cutpoint	True positives	True negatives	False positives	False negatives							
	No. of correctly predicted events	No. of correctly predicted non-events	No. of non-events predicted as events	No. of events predicted as non-events	Sensitivity	Specificity	PPV	NPV	Distance from perfect marker (0, 1)	Distance from non-informative marker (diagonal line)	Positive utility index	Negative utility index
≥0	191	0	1024	0	1.00	0.00	0.16	–	1.000	0.000	0.157	–
≥1	181	476	548	10	0.95	0.46	0.25	0.98	0.538	0.412	0.235	0.455
≥2	177	589	435	14	0.93	0.58	0.29	0.98	0.431	0.502	0.268	0.562
≥3	173	695	329	18	0.91	0.68	0.34	0.97	0.335	0.584	0.312	0.662
≥4	168	787	237	23	0.88	0.77	0.41	0.97	0.261	0.648	0.365	0.747
≥5	159	847	177	32	0.83	0.83	0.47	0.96	0.241	0.660	0.394	0.797
≥6	137	924	100	54	0.72	0.90	0.58	0.94	0.299	0.620	0.415	0.853
≥7	116	972	52	75	0.61	0.95	0.69	0.93	0.396	0.557	0.419	0.881
≥8	81	1004	20	110	0.42	0.98	0.80	0.90	0.576	0.405	0.340	0.884
≥9	49	1018	6	142	0.26	0.99	0.89	0.88	0.743	0.251	0.229	0.872
≥10	23	1022	2	168	0.12	1.00	0.92	0.86	0.880	0.118	0.111	0.857

Event = diagnosis of moderate anxiety; non-event = does not have moderate/severe anxiety.
ESAS-A, Edmonton Symptom Assessment System anxiety, GAD-7, Generalised Anxiety Disorder-7; PPV, positive predictive value; NPV, negative predictive value.

Table 4. Accuracy measures for ESAS-D scores against PHQ-9 (score ≥ 10) for 1215 mixed cancer patients

ESAS depression cutpoint	True positives: No. of correctly predicted events	True negatives: No. of correctly predicted non-events	False positives: No. of non-events predicted as events	False negatives: No. of events predicted as non-events	Sensitivity	Specificity	PPV	NPV	Distance from perfect marker (0, 1)	Distance from non-informative marker (diagonal line)	Positive utility index	Negative utility index
≥0	262	0	953	0	1.00	0.00	0.22	–	1.000	0.000	0.216	–
≥1	243	604	349	19	0.93	0.63	0.41	0.97	0.373	0.561	0.381	0.614
≥2	226	690	263	36	0.86	0.72	0.46	0.95	0.308	0.587	0.399	0.688
≥3	210	775	178	52	0.80	0.81	0.54	0.94	0.273	0.615	0.434	0.762
≥4	193	838	115	69	0.74	0.88	0.63	0.92	0.290	0.616	0.462	0.812
≥5	169	878	75	93	0.65	0.92	0.69	0.90	0.364	0.566	0.447	0.833
≥6	130	911	42	132	0.50	0.96	0.76	0.87	0.506	0.452	0.375	0.835
≥7	107	925	28	155	0.41	0.97	0.79	0.86	0.592	0.379	0.324	0.831
≥8	69	939	14	193	0.26	0.99	0.83	0.83	0.737	0.249	0.219	0.817
≥9	37	946	7	225	0.14	0.99	0.84	0.81	0.859	0.134	0.119	0.802
≥10	15	951	2	247	0.06	1.00	0.88	0.79	0.943	0.055	0.051	0.792

Event = diagnosis of moderate/severe depression; non-event = does not have moderate/severe depression.
ESAS-D, Edmonton Symptom Assessment System depression, PHQ-9, Patient Health Questionnaire-9; PPV, positive predictive value; NPV, negative predictive value.

cut-off of ≥5 for ESAS-A results in a sensitivity/specificity in closest proximity to the perfect maker (0.1) and the highest Youden's J index (sensitivity of 0.83, specificity of 0.83). Similarly, an optimal cut-off for detecting depression using these indices is ≥3 (Fig. 2), with a sensitivity of 0.80 and specificity of 0.81. Although these cut-offs provide good NPV (0.96 for anxiety, 0.94 for depression) and UI– (0.80 for anxiety, 0.76 for depression), their PPV (0.47 for anxiety, 0.54 for depression) and UI+ (0.40 for anxiety, 0.43 for depression) performance is only moderate. This demonstrates that the emotional domains of ESAS perform adequately for screening, but there is no cut-off providing a UI+ sufficient for case finding as determined by GAD-7 and PHQ-9 summed scores ≥10. ROC analyses conducted with higher and lower criterion cut-offs for GAD-7 and PHQ-9 did not improve performance of ESAS-A or ESAS-D for screening or case finding (data not shown).

For screening purposes, maximal sensitivity and NPV are desired. In this cohort, an ESAS-A cut-off of 3 was selected as most appropriate for screening purposes, providing superior performance with a sensitivity of 0.91, specificity of 0.68, PPV of 0.34 and NPV of 0.97. This is illustrated in the Bayesian conditional probability plot, comparing a cut-off of 3 versus the cut-off of 5 identified by ROC analysis (Fig. 3). At our pre-test probability of 0.157, there is an increase in the rule-out gain with an acceptable expense of rule-in gain. Using a cut-off of ≥5, 28% of patients were potentially identified with anxiety, compared to 41% using a cut-off of ≥3. Similarly, to maximise screening potential, an ESAS-D cut-off of ≥2, with a sensitivity of 0.86, specificity of 0.72, PPV of 0.46 and PPV of 0.95 was selected. The conditional probability plot comparing the cut-off of 2 versus the cut-off of 3 identified by ROC analysis, depicts an increase in rule-out gain at a pre-test probability of 0.216 (Fig. 4). At an ESAS-D cut-off of ≥3, 32% of patients were identified with potential depression, compared to 40% at a cut-off of ≥2.

DISCUSSION

This study is the first to demonstrate that the ESAS emotional distress items have good concordance with previously well-validated measures of anxiety and depression. This conclusion is supported by strong Spearman's correlation coefficients (0.74 for anxiety, 0.72 for depression) and high AUC values (0.89 for anxiety and 0.88 for depression) in relation to GAD-7 and PHQ -9. As well, suggested cut-offs of ESAS-A ≥ 3 and ESAS-D ≥ 2 showed good discrimination with high sensitivity and NPV for moderate anxiety (0.91 and 0.97) and moderate depression (0.86

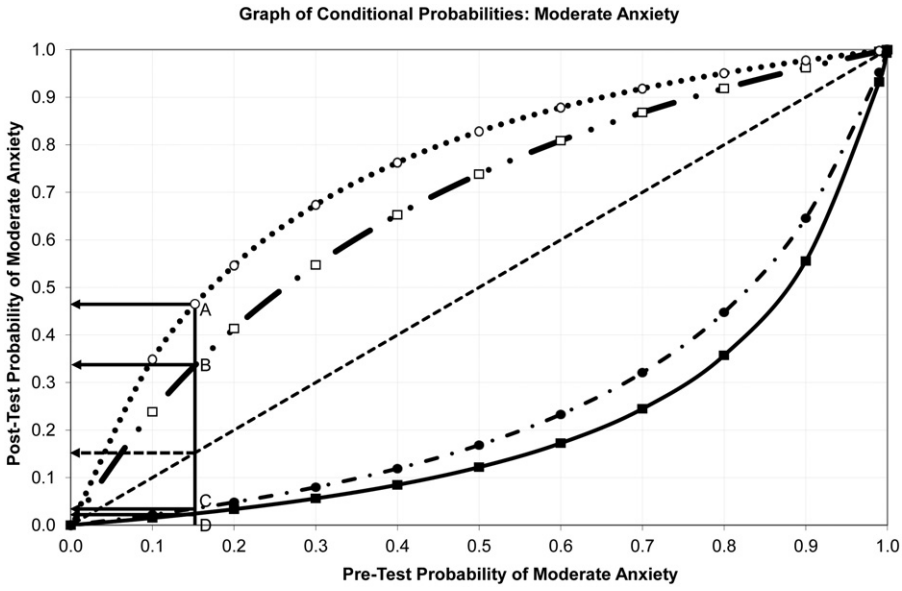

Figure 3. Bayesian conditional probability plot of Edmonton Symptom Assessment System anxiety scores against Generalised Anxiety Disorder-7 scores. The plot shows rule-in and rule-out success in identifying anxiety. Gain in accuracy at Edmonton Symptom Assessment System scores 3 and 5 is shown at an anxiety prevalence of 15.7%. A, rule-in gain at cutpoint of 5; B, rule-in gain at cutpoint of 3; C, rule-out gain at cutpoint of 5; D, rule-out gain at cutpoint of 3. (▬□▬) Test positive; cutpoint 3; (•○•) test positive; cutpoint 5; (▬■▬) test negative; cutpoint 3; (▬●•) test negative; cutpoint 5; (- - - -) baseline probability.

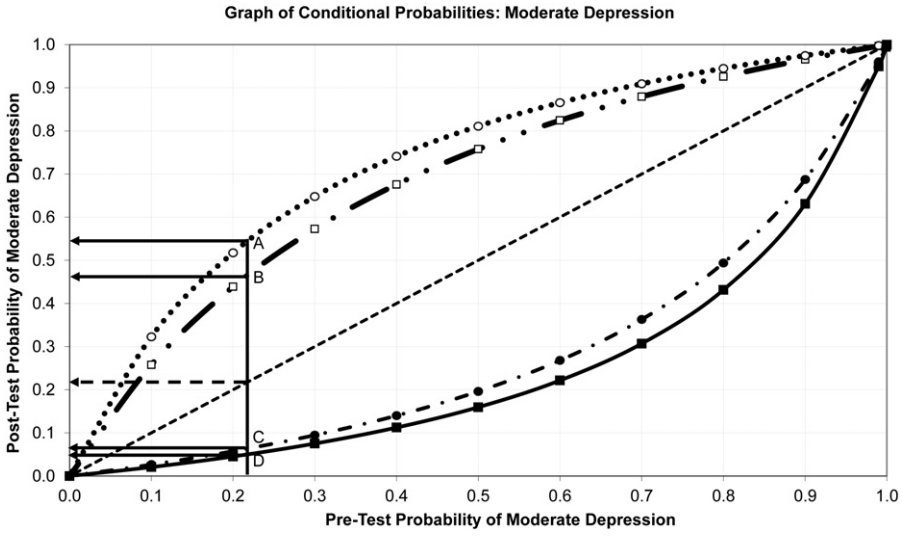

Figure 4. Bayesian conditional probability plot of Edmonton Symptom Assessment System depression scores against Patient Health Questionnaire-9 scores. The plot shows rule-in and rule-out success in identifying depression. Gain in accuracy at Edmonton Symptom Assessment System scores 2 and 3 is shown at a depression prevalence of 21.6%. A, rule-in gain at cutpoint of 3; B, rule-in gain at cutpoint of 2; C, rule-out gain at cutpoint of 3; D, rule-out gain at cutpoint of 2. (▬□▬) Test positive; cutpoint 2; (•○•) test positive; cutpoint 3; (▬■▬) test negative; cutpoint 2; (▬●•) test negative; cutpoint 3; (- - - -) baseline probability.

and 0.95), addressing previous criticism about the lack of established cut-offs for ESAS for emotional distress (Richardson & Jones 2009).

ESAS-A and ESAS-D scores of ≥4 have been adopted in distress screening programmes to trigger the need for clinician assessment or intervention (Dudgeon *et al.* 2012). However, the relative lack of specificity limits the value of the ESAS emotional distress items alone for case finding. Our recommended cut-off scores of ESAS-A ≥ 3 and ESAS-D ≥ 2 yield specificity and PPV values of 68% and 34% respectively for anxiety and 72% and 46% respectively for depression. This is consistent with Mitchell's finding that the pooled ultra-short screening methods have only 66.8 % specificity and 34.2% PPV for depression and 56.6 % specificity and 55.2% PPV for anxiety (Mitchell 2007).

Richardson and Jones (2009) suggest that such lack of specificity may be because patients' interpret the terms 'depressed' and 'anxious' on the ESAS to include non-pathological and contextual sadness rather than to depression or anxiety that correspond to psychiatric disorders. This is supported by qualitative studies and studies indicating significant fluctuations in ESAS-D scores within days (Dudgeon *et al.* 1999; Brechtl *et al.* 2006). These findings suggest that ESAS-A and ESAS-D are not solely adequate to identify potential cases of depression and anxiety.

The present findings identify cut-offs on ESAS-A and ESAS-D that can be used for pre-screening in oncology clinics. The use of ESAS for this purpose can identify potential cases with few false negatives, but a second

screening step is needed to minimise false positives and identify true cases (Mitchell 2010; Bergh *et al*. 2011). This may be accomplished by using an interactive tailored patient assessment whereby patients complete a computerised assessment instrument in which follow-up questions are individually tailored, based on the initial response (Ruland *et al*. 2010). A two-stage sequential screening process with a short tool used initially to improve the overall accuracy and efficiency of screening, reducing patient and clinician burden and making efficient use of resources.

Limitations of the present study include the lack of a diagnostic interview and previous validation of GAD-7 cut-offs in a cancer population. Strengths of the study include: a large sample size; naturalistic data collection as part of routine care, which minimises recruitment bias seen in research trials; and prospective and concurrent data collection, which minimises limitations of retrospective chart reviews. Furthermore, inclusion of multiple cancer types increases generalisability of the findings and provision of Bayesian probability plots permits comparison of the performance of our recommended cut-offs with populations having different distress prevalence.

With growing recognition that detection of psychological symptoms in cancer clinics is inadequate, there is increasing acceptance of the potential value of distress screening. Although distress screening guidelines are available from several cancer control agencies, uptake of these guidelines has been inconsistent, in part due to uncertainty about the optimal tool and the feasibility of routine screening (Jacobsen & Ransom 2007). We posit that a two-step screening programme, with an initial screen by a short tool such as ESAS, followed by more specific screening with tools such as PHQ-9 or GAD-7, would maximise screening accuracy and minimise overall burden for both patients and clinicians. Ongoing research is required to improve acceptability of screening programmes within cancer care and to assess the overall benefit of screening with regard to distress reduction and other health outcomes.

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