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Distress in suspected lung cancer patients following rapid and standard diagnostic programs: a prospective observational study

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Abstract

***Objective*: Timeliness may influence emotional distress during the diagnostic phase of suspected lung cancer patients. We performed a prospective observational study to compare distress and quality of life (QoL) in two medical centres with a Rapid Outpatient Diagnostic Program (RODP) and two using conventional Stepwise Diagnostic Approach (SDA) on the basis of trained nurse-led care.**

***Methods*: Outpatients with radiological suspicion of lung cancer completed the Hospital Anxiety and Depression Scale (HADS), European Organization for Research and Treatment of Cancer 30-item Quality of Life Questionnaire (QLQ-C30) and its 13-item Lung Cancer specific module (QLQ-LC13) upon first visit, 2 days later, thereafter weekly for 5 weeks and after 3 months.**

***Results*: The 72 SDA patients and 121 RODP patients had a mean pre-diagnostic HADS-total score of 13.5 (SD 7.6); 63.4% had a score ≥10. Baseline QLQ-C30 global QoL was 61.6 (SD 22.7) exceeding reference values for lung cancer patients. Generalized least square models showed a significant centre by time interaction effect: during the first 6 weeks, HADS-total scores decreased in RODP patients (13.8–11.9) but sustained in SDA patients (13.1–13.6), whereas QoL showed no relevant changes. Times to diagnosis and discussion of therapy plan for RODP patients were 7 and 11 days shorter, respectively.**

***Conclusions*: Suspected lung cancer patients had high baseline distress levels. A decrease over time was found in RODP compared with SDA patients. QoL did not change relevantly. Albeit observational, these data indicate that patients experience less distress in rapid diagnostic programs than in stepwise diagnostic evaluation.**

Background

Many cancer patients experience emotional distress. The National Comprehensive Cancer Network definition of distress is a multifactorial unpleasant emotional experience of psychological, social and/or spiritual nature that may interfere with the ability to cope with cancer [1]. Distress is mostly characterized by anxiety or depressive symptoms, and with prevalences ranging from 20% to 50% [2,3], these play an important role in cancer. Deservedly, distress has become a well-acknowledged issue in oncological supportive care [1] and should be considered equally significant at the moment of confrontation with the diagnosis [4]. Although studies are neither abundant nor uniform and mostly limited to breast cancer patients, they at least suggest very high distress levels (specifically anxiety) in patients confronted with the mere possibility of a cancer diagnosis, sustaining after confirmation of the diagnosis but reducing after exclusion of cancer [5]. The psychological impact of the diagnostic phase is additionally highlighted by studies on outcomes of breast cancer screening showing that patients eventually not diagnosed to have cancer still may experience psychological consequences afterwards [6]. Lung cancer patients report general distress levels during the course of disease that are among the highest of all cancer types [2,3]. In this respect, they may be considered a different patient group, which is more at risk, also around diagnosis; a substantial group as well if the recent calls for implementation of lung cancer screening [7] are adopted.

Being diagnosed with cancer takes time, which can be minimized by a one-stop or two-stop pathway (for which we use the generalized term 'Rapid Outpatient Diagnostic Program' (RODP)). RODPs have been developed for

several cancer types [8]. Especially in lung cancer, often requiring multiple diagnostic and staging procedures, an RODP is a valuable tool to improve timeliness [9,10]. An RODP shortens the diagnostic period and in turn the period of diagnosis-related distress, without detrimental effects on anxiety compared with conventional pathways as was demonstrated in breast cancer patients [11–13]. However, suspected lung cancer requires a different usually more invasive diagnostic approach, and patients might, as stated before, be more at risk.

The present article addresses the question whether timeliness of the diagnostic evaluation has an effect on distress and quality of life (QoL) in patients with suspected lung cancer. We report the results of the Pulmonary Evaluation of NEoplastic Lesions in Outpatients and its Psychological Effects (PENELOPE) study that was designed to evaluate patients in a prospective observational design using validated distress and QoL measures before and during the diagnosis of a possible lung cancer up to 3 months in four different medical centres in the Netherlands comparing RODP with regular standard diagnostic approach (SDA). We hypothesized that patients in an RODP would experience less distress and a better QoL during the diagnostic phase than during conventional SDA; furthermore, we hypothesized equal distress and QoL scores at baseline before diagnostic analysis for both patient groups and higher scores than general reference values for lung cancer patients. Although studies on emotional distress usually focus on anxiety, we chose distress as primary endpoint; a broader term and a parameter that is more comparable after the 3-month interval when the acute anxiety symptoms usually play a less important role, and depression may be the factor promoting distress.

Methods

Participants and procedures

Between January 2009 and July 2010, we performed the PENELOPE study for suspected lung cancer patients in two university medical centres (Radboud University Nijmegen Medical Centre (RUNMC) and University Medical Centre Groningen (UMCG)) and two general hospitals (Gelderse Vallei Medical Centre (GVMC) and Atrium Medical Centre Heerlen (AMCH)) in the Netherlands. In both subsets, one centre with an RODP and one using an SDA were selected. In the RUNMC RODP, patients underwent laboratory investigation, integrated ^{18}F-fluorodeoxyglucose Positron Emission Tomography-Computed Tomography (FDG-PET/CT) scan, pulmonary function test, consultation with pulmonary physician, and bronchoscopy in 2 days time and received cytology results on the second day, Endoscopic Ultrasound (EUS) or Endobroncial Ultrasound (EBUS) and further pathology results later that week or ultimately the seventh day if applicable. The AMCH implemented an RODP based on a 3-day schedule: FDG-PET/CT, pulmonary function tests and laboratory investigation on the first, bronchoscopy on the second and/or EUS of EBUS on the third and pathology results on the seventh day. Both other centres used an SDA based on trained nurse-led care. For this study, all patients with a radiological suspicion of lung cancer were eligible if they were 18 years and older and were able to complete printed questionnaires. Patients were given verbal and written information about the study. After obtaining informed consent, patients were asked to complete sets of questionnaires on that day (day one) and day three, and thereafter weekly for 5 weeks. A final questionnaire was sent by mail 3 months after the last to enable comparison of both groups' scores after the diagnostic process itself. Patients' baseline demographic and disease characteristics, and final diagnosis were recorded and collected after the study was completed.

Questionnaires

Questionnaires were completed at home and returned by mail. Sets consisted of the Hospital Anxiety and Depression Scale (HADS) [14], the European Organization for Research and Treatment of Cancer (EORTC) 30 item Quality of Life Questionnaire (QLQ-C30) [15] and its 13-item Lung Cancer specific module (QLQ-LC13) [16] and the EuroQol-5D questionnaire [17]. We present results of the first two questionnaires in this article because we were specifically interested in distress and QoL. Not relevant for this study was the EuroQol-5D questionnaire, measuring health states specifically for the valuation of health in health economy studies.

The HADS is a 14-item questionnaire consisting of two subscales: anxiety and depression. Items are rated on a 4-point scale, rendering a maximum total score of 21. On either subscale, scores of 0–7 are considered normal; scores of over 11 are considered a significant 'case' of psychological morbidity and scores of 8–10 are considered 'borderline' and indicate potential clinical anxiety or depression. A large meta-analysis concluded that a total score of 10 or more is the optimal threshold for significant emotional distress [18]. The major advantage of the HADS is exclusion of physical symptoms of anxiety and depression such as weight loss and fatigue. It has been well validated against structured clinical interviews (the 'gold standard' for the assessment of mental disorders) and is considered a reliable, sensitive and specific screening tool for psychological distress in oncology [19].

The EORTC QLQ-C30 is a frequently used cancer-specific QoL questionnaire, widely accepted for its validity [20] containing 30 items on patients' functioning, global QoL and both disease- and treatment-related symptoms. Raw scores are linearly transformed to give standard scores in the range of 0–100 for each of the

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functioning and symptom scales. Higher scores in the global and functioning scales and lower scores in the symptom scales indicate better QoL. A difference of 5–10 points in the scores represents a small change, 10–20 points a moderate change and greater than 20 points a large clinically significant QoL change [21].

Outcomes

The outcomes of the study were distress (reflected by the HADS-total score), anxiety (HADS-anxiety subscale), depression (HADS-depression subscale) and QoL (QLQ-C30 global QoL) at baseline (day one) and during the entire diagnostic analysis (day one to week six).

Statistical power

We calculated that, on the basis of a single measurement per sampling unit, for a power of 0.8 with $\alpha = 0.05$, 63 patients were needed in both RODP and SDA groups to show a significant 10–20 points 'moderate difference' in global QoL score QLQ-C30 [21].

Data analysis

We used generalized least squares models to model the course of distress and QoL over the first 38 days, which enabled us to explore the dependence caused by the repeated measurements on the same patients. A Toeplitz correlation structure coupled with heterogeneous variances provided the best fit for these data, based on the Akaike information criterion. The dependent variables were distress levels (reflected by the HADS-total score), the HADS-anxiety subscore levels and the QLQ-C30 global QoL score. Dependent variables were time (entered into the model as a factor with seven levels), centre type (RODP and SDA) and the interaction between these two. A significant interaction implies that the course over time is different for the two centre types. Figures depicting the estimated marginal means (with standard errors) based on this model are presented. Analyses were repeated within strata defined by gender and diagnosis outcome (benign and malignant). The measurement at 3 months was analysed separately because the much larger time would necessitate a much more complex correlation structure; moreover, centre type was not expected to still have an effect on outcomes given the long interval since diagnosis. An advantage of generalized least square models is that subjects with a missing outcome on a certain time point can contribute to the results using the observations that are present, assuming that the few missing values did not influence outcome. All data were analysed using the SPSS 19 statistical software program (SPSS, Chicago, IL). Continuous variables were compared using the unpaired *t*-test or Mann–Whitney-*U* test; categorical variables were compared using the χ^2-test. Differences were considered statistically significant if $p < 0.05$.

Results

Patients

Figure 1 shows a flow chart of the 407 patients that had been asked to participate between January 2009 and July 2010; eventually, 193 patients returned one or more questionnaires. Three RODP patients and one SDA patient died before completing the last questionnaire at 3 months. Patient numbers per participating centre were as follows: RUNMC 87 (45.1%), AMCH 34 (17.6%), GVMC 55 (28.5%) and UMCG 17 (8.8%). As shown in Table 1, this resulted in significantly more tertiary care patients and more patients with synchronous or recent cancer diagnoses in the RODP group compared with the SDA group; however, no significant differences in age, gender, lung cancer diagnosis and curative therapy were found. Separate analysis of the 104 lung cancer patients showed that significantly more patients in the RODP were surgically treated. Furthermore, as might be expected as a result of the different practice organizations, median times to reach a diagnosis and discuss therapy plan were 7 and 11 days shorter for RODP patients, respectively. However, the interval between first visit and actual start of therapy in case of lung cancer was not significantly different.

Pre-diagnostic distress and QoL

Pre-diagnostic distress as measured by the baseline mean HADS-total score was 13.5 (SD 7.6), or from a different perspective, 63.4% of patients had a HADS-total score of 10 or higher, indicating significant distress. Furthermore, 51.8% of patients had a HADS-anxiety score over 7 (borderline anxiety) and 19.8% scored over 10 (case anxiety). Baseline mean HADS-total scores of patients with a cancer diagnosis were higher (14.7) when compared with patients with a benign outcome (11.8, $p = 0.010$) as were mean HADS-anxiety scores (8.3 and 6.7, respectively, $p = 0.009$); for HADS-depression scores, there was a trend towards lower scores in SDA patients (6.4 and 5.2, respectively, $p = 0.052$). Comparison of baseline EORTC QLQ-C30 and LC-13 subscales between patients with eventual malignant and benign results revealed significant and relevant (more than 10 points) differences only in physical functioning (74 and 84, respectively, $p = 0.002$) and appetite loss (26 and 15, respectively, $p = 0.002$). Mean HADS-total scores at baseline were not statistically different between men and women (13.0 and 14.5, respectively, $p = 0.20$), neither were HADS-depression scores ($p = 0.71$), although baseline mean HADS-anxiety score tended to be higher in women (8.4) compared with men (7.2, $p = 0.502$).

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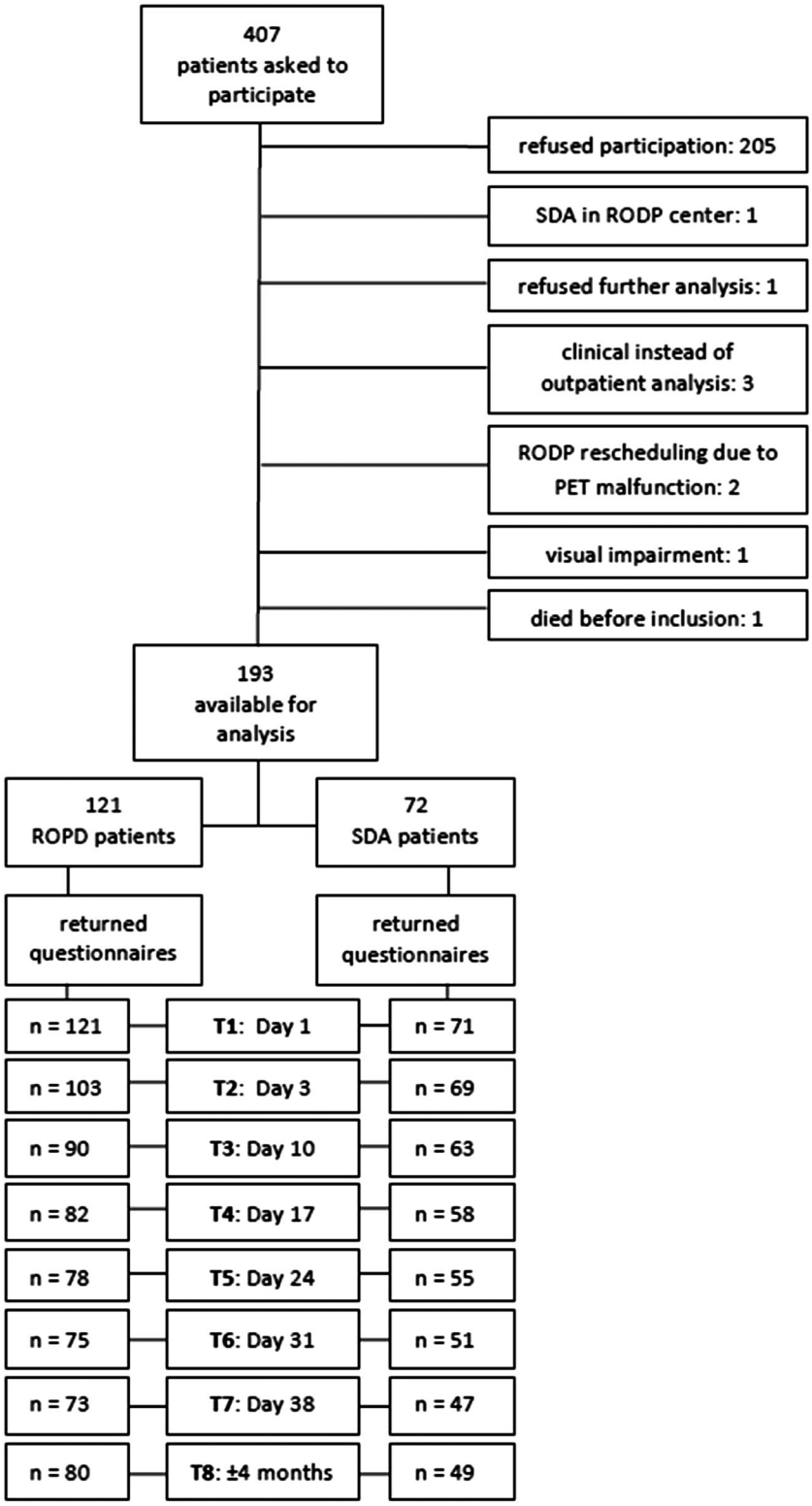

Figure 1. Flow chart of patient inclusion, reasons for exclusion, numbers of returned questionnaires at different time points

Baseline HADS-total scores did not differ significantly between RODP and SDA patients, but HADS-anxiety scores did (8.2 and 6.5, respectively, $p = 0.01$, Table 1).

Pre-diagnostic global QoL for all patients was 61.6 (SD 22.7) measured by the global QoL score of the QLQ-C30 and was not statistically different between RODP and SDA patients. Subscores were not significantly different

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Table 1. Baseline clinical characteristics (*N* (%)), or median (IQR (interquartile range)), baseline mean (SD) anxiety, depression and QoL scores

Clinical characteristics: all patients	RODP centres *N* = 121	SDA centres *N* = 72	*p*
Mean age (SD)	63.4 (9.6)	64.9 (8.9)	0.26
Tertiary Care centre	87 (71.9)	17 (23.6)	<0.001
Male	75 (62)	48 (66.7)	
Female	46 (38)	24 (33.3)	0.43
Cancer history			
Any history of cancer	34 (28.1)	9 (12.5)	0.01
Over 5 years ago	18 (14.9)	6 (8.3)	0.18
1–5 years ago	15 (12.4)	3 (4.2)	0.06
Less than 1 year and synchronous	16 (13.2)	1 (1.4)	0.01
Median time intervals in days (IQR)			
Visit to diagnosis	7 (0–17)	14 (12–26)	<0.001
Visit to lung cancer therapy plan	8 (1–21)	19 (14–27)	<0.001
Visit to lung cancer therapy	31 (19–43)	37 (26–48)	0.08
Diagnosis lung cancer	62 (51.2)	42 (58.3)	
Other diagnosis	59 (48.8)	30 (41.7)	0.34
Non-malignant	49 (40.5)	24 (33.3)	
Metastasis	8 (6.6)	1 (1.4)	
No diagnosis, follow up	2 (1.7)	5 (6.9)	0.03
Lung cancer clinical Stage (*N* = 104)			
Stages I–IIIA	37 (59.7)	18 (42.9)	
Stages IIIB–IV	25 (40.3)	24 (57.1)	0.09
Lung cancer therapy (*N* = 104)			
Surgical	29 (46.8)	8 (19.0)	
Non-surgical	29 (46.8)	26 (61.9)	
None	4 (6.5)	8 (19.0)	0.01
Lung cancer therapy (*N* = 104):			
Curative	40 (64.5)	24 (57.1)	
Palliative	18 (29.0)	10 (23.8)	
None	4 (6.5)	8 (19.0)	0.14
Mean baseline questionnaire scores (SD)			
HADS scores			
Total score	13.8 (7.6)	13.1 (7.8)	0.55
Anxiety subscale	8.2 (4.2)	6.5 (4.0)	0.01
Depression subscale	5.5 (4.2)	6.5 (4.5)	0.11
QLQ-C30 global QoL score	63.6 (23.2)	58.2 (23.3)	0.11
QLQ-C30 functioning scores			
Physical	78.5 (20.7)	78.4 (19.7)	0.99
Cognitive	82.8 (17.5)	83.8 (19.9)	0.71
Emotional	67.4 (21.9)	69.6 (22.8)	0.50
Role	72.7 (29.2)	70.2 (29.9)	0.57
Social	87.2 (20.4)	84.3 (19.1)	0.32
QLQ-C30 symptom scores			
Financial difficulties	8.1 (19.8)	6.6 (17.5)	0.60
Dyspnea	35.8 (31.4)	38.0 (32.0)	0.64
Pain	17.2 (25.5)	24.4 (27.7)	0.07
Fatigue	29.1 (24.8)	38.7 (27.1)	0.01
Sleep	31.1 (33.3)	32.4 (31.9)	0.80
Appetite loss	21.9 (31.0)	21.6 (29.9)	0.94
Nausea	5.1 (11.4)	7.7 (17.8)	0.22
Constipation	8.6 (19.6)	7.5 (18.0)	0.70
Diarrhoea	8.6 (18.6)	4.2 (13.7)	0.09

QoL, quality of life; RODP, Rapid Outpatient Diagnostic Program; SDA, Stepwise Diagnostic Approach; HADS, Hospital Anxiety and Depression Scale; QLQ-C30, European Organization for Research and Treatment of Cancer 30-item QoL Questionnaire.

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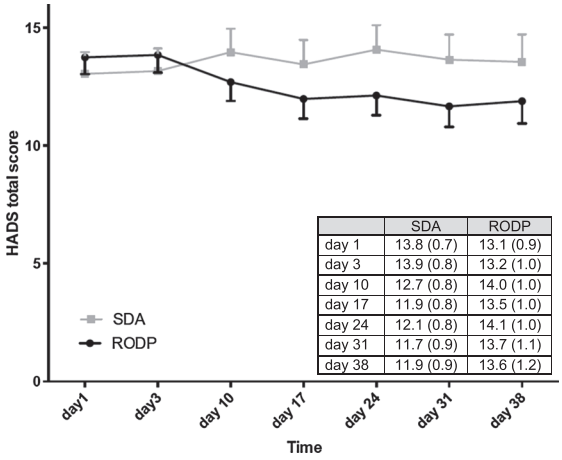
between centre types; only fatigue was reported significantly more often in the SDA group (Table 1).

The course of distress and QoL

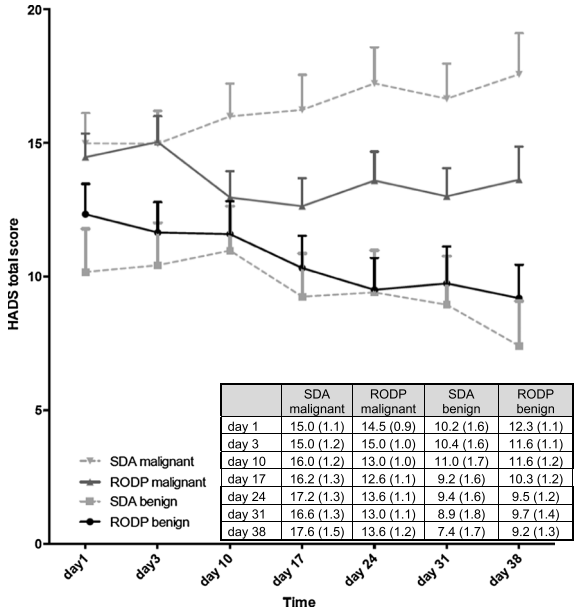
Distress levels measured with the total HADS scores during the course of the diagnostic evaluation of all patients are depicted in Figure 2. Over time, the HADS-total scores decreased in RODP patients from 13.8 at baseline to 11.9 on day 38 but sustained in SDA patients (13.1 and 13.6, respectively), showing a significant centre (2) by time (7) interaction effect ($p = 0.034$). The HADS-anxiety subscale showed a similar interaction effect ($p = 0.029$) over time. A small but statistically significant between-groups effect ($p = 0.038$) became apparent for HADS-D scores being slightly higher in SDA patients (differences between 0.4 and 2.0); however, there was no interaction effect. After 3 months, the differences in HADS-total scores between RODP and SDA patients disappeared (mean 11.5 and 11.8, respectively, $p = 0.91$). Patients with a benign diagnosis reported lower scores than cancer patients (8.5 and 13.2, respectively, $p = 0.01$).

Reviewing both genders separately, a centre type (2) by time (7) interaction effect ($p = 0.043$) on HADS-total scores was found in men ($p = 0.043$) but not in women ($p = 0.49$). As for diagnosis, patients with a cancer diagnosis (lung and other) reacted significantly differently in RODP compared with SDA centres in terms of HADS-total scores (Figure 3, $p = 0.010$) but patients with benign disease did not ($p = 0.78$). In these patients, similar differences were found for both HADS-anxiety subscale ($p = 0.027$ and 0.761, respectively) and HADS-depression subscale ($p = 0.005$ and 0.603, respectively).



	SDA	RODP
day 1	13.8 (0.7)	13.1 (0.9)
day 3	13.9 (0.8)	13.2 (1.0)
day 10	12.7 (0.8)	14.0 (1.0)
day 17	11.9 (0.8)	13.5 (1.0)
day 24	12.1 (0.8)	14.1 (1.0)
day 31	11.7 (0.9)	13.7 (1.1)
day 38	11.9 (0.9)	13.6 (1.2)

Figure 2. Hospital Anxiety and Depression Scale (HADS)-total scores of all Stepwise Diagnostic Approach (SDA) and Rapid Outpatient Diagnostic Program (RODP) patients over time, means and standard errors of means



	SDA malignant	RODP malignant	SDA benign	RODP benign
day 1	15.0 (1.1)	14.5 (0.9)	10.2 (1.6)	12.3 (1.1)
day 3	15.0 (1.2)	15.0 (1.0)	10.4 (1.6)	11.6 (1.1)
day 10	16.0 (1.2)	13.0 (1.0)	11.0 (1.7)	11.6 (1.2)
day 17	16.2 (1.3)	12.6 (1.1)	9.2 (1.6)	10.3 (1.2)
day 24	17.2 (1.3)	13.6 (1.1)	9.4 (1.6)	9.5 (1.2)
day 31	16.6 (1.3)	13.0 (1.1)	8.9 (1.8)	9.7 (1.4)
day 38	17.6 (1.5)	13.6 (1.2)	7.4 (1.7)	9.2 (1.3)

Figure 3. Hospital Anxiety and Depression Scale (HADS)-total scores in patients with benign and malignant diagnoses, means and standard errors of means

The mean QoL as indicated by the QLQ-C30 global scale showed neither significant differences between RODP and SDA patient groups ($p = 0.131$) nor clinical relevant changes (i.e. less than 5 on the 0–100 scale [21]) over the 6 weeks that patients were followed. No differences were observed between both genders ($p = 0.214$ for women, 0.56 for men). However, in patients with benign diagnoses, QoL improved 10.9 (moderate change) for SDA and 7.51 (light change) for RODP patients ($p = 0.40$); patients with cancer did not show relevant changes during the course of the study.

Because cancer history and surgery were more prevalent in RODP patients, we tried to determine whether these resulted in different patterns of HADS-total, HADS-anxiety and QLQ-C30 global scale but found no significant interaction effect.

Discussion

This observational study shows that in patients in the diagnostic phase of suspected lung cancer, pre-diagnostic distress levels are very high, not only at baseline but also during the first weeks of diagnostic evaluation when almost two-thirds of suspected lung cancer patients reach substantial distress levels [14,18]. Distress levels show different patterns over time: sustainment of distress in SDA patients and distress decrease in RODP patients. These findings are important because distress during the diagnostic phase of lung cancer has not been studied before [5] and many cancer patients suffering from psychological distress often remain unidentified [22,23].

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Pre-diagnostic distress

Pre-diagnostic distress of suspected lung cancer has only been reported by Montazeri *et al.* [24]: 16% of patients had HADS-anxiety scores over 7, and 10% over 10 – remarkably low compared with our findings (51.8% and 19.8%, respectively), especially when taking into account the possible bias of this study in reporting results of patients with a confirmed lung cancer diagnosis only. In fact, our results are much more in line with studies on suspected breast cancer patients reporting baseline HADS-anxiety levels over 8 in 46–63% [12,13,24,25] and over 10 in 28–48% [11,12,26] of cases. Although other studies on pre-diagnostic anxiety used different instruments, high levels were reported in suspected breast, ovarian and prostate carcinoma patients [9]. This may confirm that the suspected lung cancer patient is not different from other suspected cancer patients in terms of distress levels and, moreover, that the extreme levels in the present study are not unusual.

A remarkable outcome was that patients with an eventual cancer diagnosis in our study had significantly higher baseline distress levels compared with those with benign disease. Two studies in breast cancer patients [27,28] reported similar findings, possibly reflecting (non-verbal) cues that patients might have perceived from their physician [28]. We cannot exclude that patients may have experienced more distress due to symptoms and therefore suspect a worse outcome, as analysis of subscores of the QLQ-C30 and -LC13 questionnaires showed small but possibly relevant differences in patients with an eventual cancer diagnosis experiencing less physical functioning and more appetite loss. Furthermore, information given by the general practitioner at referral may have played a role and finally, because lung cancer is usually still smoking related, feelings of guilt due to previous smoking.

Distress: the effect of timeliness

Regarding our hypothesis on the effect of an RODP in terms of distress, we found that over time, distress reflected by HADS-total and HADS-anxiety scales decreases faster in RODP patients. This may suggest a beneficial effect of the shorter time interval to reach a diagnosis and/or the programmed approach itself on patients' mental well-being. Post hoc analysis showed that this benefit was more profound in men and patients with an eventual cancer diagnosis. Eventually after 3 months, differences disappeared and distress levels decreased, although cancer patients were still far above the 10-point threshold indicating persisting distress [18]. Other studies in this respect are limited, small and focus on suspected breast cancer patients: [9] Dey *et al.* [13] found a significantly larger reduction of anxiety in one-stop evaluation compared with two-stop evaluation (in which suspected breast cancer patients were still awaiting results). This difference disappeared after 3 weeks. In two other studies [11,12], suspected breast cancer patients who were given benign results rapidly experienced significantly less anxiety after 1 week than those still waiting for results. After communication of malignant results, all studies showed equal increases of anxiety levels irrespective of diagnosis or diagnostic pathway.

Quality of life

Baseline global QoL was around six points higher than the reference lung cancer patients' values after diagnosis [29] and did not change relevantly despite the high distress levels and different diagnostic organisation types. This contrasts with the QoL results in the study by Harcourt *et al.* [11] in suspected breast cancer patients showing significant deterioration of several aspects of QoL in a one-stop diagnostic group compared with two-stop, and a significant increase in patients having benign results. Murray *et al.* reported similar decreases in role, social and financial functioning after diagnosis of lung cancer in patients randomized between 1 day and conventional evaluation; however, this comparison was performed after 6 weeks [30].

Clinical implications, limitations and strengths

Despite the descriptive and retrospective nature of the study, it has a wide socioeconomic and geographical range reflecting the population of lung cancer patients in the present-day practice in the Netherlands. The results should at least raise awareness among clinicians about the very high distress levels in suspected lung cancer patients; implementation of an RODP can be a relatively simple tool to address these.

This study features a substantial patient sample, followed over a longer period at fixed intervals during the diagnostic episode. To our knowledge, this has not been performed before. Although observational in design, it was performed as a multicentre study with university and general hospitals in both subsets of compared patients groups and relatively few missing data.

This study has some limitations. It is not a randomized trial and, although randomisation of this patient category is virtually impossible, should be interpreted with care. First, generalizability is restricted: more patients were included in RODP centres compared with SDA centres, the largest contributing centre being a university hospital, although post hoc analysis showed no interaction effect of surgery or cancer history (more frequent in the RODP patient sample) on the outcome parameters. Because PENELOPE is a descriptive study, we could not control for differences in atmosphere or in approach by medical personnel possibly influencing outcome variables, although the effect of the latter factor is probably limited as patients were seen by different medical personnel per centre. Furthermore, smoking status was not recorded, and given

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the known associations between smoking and lung cancer, this may have been an important variable. Second, missing patient-reported data required remodelling the course of distress and QoL by generalized least squares model. Third, post hoc analysis showed that the interaction effect regarding HADS-total scores over time was different between genders, with male patients reporting the highest scores, a remarkable finding because in various cancer types, usually women (especially younger women) report higher scores than men. Therapeutic factors might have contributed to this difference, such as surgery (which was less performed in SDA patients) or the intensity of the specific treatment [31]. Finally, half of all eligible patients refused participation. Questionnaire participation rates are rarely specifically studied, but the low rates in our patient category may not be unusual: participation rates of 39–42% have previously been reported in smoking-related cancer studies [32,33] and were possibly related to smoking. Additionally, the substantial number of questionnaires in our study may have discouraged patients to participate.

Conclusion

Our study is the first to compare diagnostic pathways in terms of perceived distress in suspected lung cancer patients, and demonstrates high distress levels at baseline before diagnosis, remaining elevated during diagnostic analysis. Within the limitations of its descriptive nature, the data suggest that patients in an RODP approach experienced less distress. After 3 months, distress level differences between RODP and SDA patients disappeared. Despite the distress, QoL was relatively unaffected and increased in patients eventually not diagnosed with cancer. Clinicians should be aware of the very high distress levels in suspected lung cancer patients and may consider implementation of an RODP to address these.

Ethical approval

After consultation, the central ethics committee confirmed that approval was not necessary for this non-interventional study.

Conflict of interest

All authors declare that they have no competing interests.

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