



Early View

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External validation of the LENT and PROMISE prognostic scores for malignant pleural effusion

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ABSTRACT

Background: Accurate survival estimation in malignant pleural effusion is essential to guide clinical management strategies and inform patient discussion. The LENT and PROMISE scores were developed to aid prognostication in malignant pleural effusion, however their uptake in practice has been limited. We aimed to conduct a detailed external validation of the LENT and PROMISE scores to develop recommendations regarding clinical utility, and to highlight factors limiting performance.

Methods: Medical records of patients diagnosed with malignant pleural effusion between 2015-2023 at Oxford University Hospitals were retrospectively reviewed to determine length of survival and the LENT and PROMISE scores at diagnosis. Performance of the scores in predicting overall survival and chance of survival at 3-, 6- and 12-months was assessed using measures of discrimination, calibration and overall model performance. Kaplan-Meier analysis and Cox models were utilised to further investigate individual score variables.

Results: 773 patients with malignant pleural effusion were included. Both scores showed predictive ability for overall survival, however median survival estimates lacked precision. Score performance in predicting survival at 3-, 6- and 12-months was stronger, with C-indices around 0.8 for both at each time-point, and the models appearing well-calibrated. Limited stratification of tumour types and lack of consideration of sensitising mutations were demonstrated to be potential factors restricting performance.

Conclusions: Both scores have ability to prognosticate in malignant pleural effusion, and greater use in practice should be considered. However, areas to improve score performance were also highlighted, and these may aid future model development.

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INTRODUCTION

Malignant pleural effusion (MPE) is a common clinical condition affecting approximately 15% of patients with cancer^{1,2}. The current incidence of MPE in the United Kingdom (UK) is estimated to be 50,000 individuals per year³, and, with the growing rate of new cancer diagnoses, this looks set to increase^{4,5}.

The presence of MPE indicates advanced disease, and median survival is typically quoted as 3-12 months^{1,6}. However, survival time can be extremely variable between individuals with some surviving many years from MPE diagnosis^{7,8}. Accurate survival prediction in this cohort is essential and significantly impacts clinical management, with a need to balance likely survival time against the frequency of hospital visits or admission for fluid control procedures⁹. International guidelines suggest that those with longer survival should undergo definite interventions such as talc pleurodesis or indwelling pleural catheter (IPC) insertion, whilst a pragmatic approach (such as repeat thoracentesis) to minimise healthcare contact should be prioritised for those with shorter survival^{1,10}. Furthermore, prognostic uncertainty has been demonstrated to cause significant distress in patients with advanced cancer¹¹, and therefore the provision of accurate survival information may improve quality of life in those diagnosed with MPE.

Physicians are notoriously poor at approximating prognosis in patients with this condition⁹. This has been demonstrated in large-scale clinical trials such as TIME-2, where, despite an exclusion criterion being an estimated survival of <3 months, 34% of participants died within this timeframe¹². To address this, a number of scores aiming to predict survival in patients with MPE have been developed and validated, the two most prominent being the LENT¹³ and PROMISE¹⁴ scores. The LENT score (Table 1) was developed from three prospectively collected databases from the UK, Australia and The Netherlands, and categorises patients into

low-, moderate- or high-risk groups with estimated median survival times of 319, 130 and 44 days respectively. The PROMISE score (Table 2) was developed to predict 90-day mortality using data from the TIME-1¹⁵, TIME-2¹² and TIME-3¹⁶ multicentre clinical trials. The PROMISE score categorises patients into four risk groups, ranging from Group A (<25% 90-day mortality) to Group D (\geq 75% 90-day mortality).

However, these prediction models have failed to be widely embraced in clinical practice⁹. This is due, at least in part, to a lack of thorough external validation since their production. In addition, it has been suggested that the predictive ability of the scores may be limited by the variables included and the nature of their use. For instance, the categorisation of tumour types in both scores into three risk groups has been argued to insufficiently reflect the heterogeneity between different underlying malignancies^{17,18}, whilst the lack of inclusion of sensitising mutations fails to account for molecular targeted therapies that may alter survival expectations^{19–21}.

In the present study, we evaluated the performance of the LENT and PROMISE scores in the largest independent cohort to date, allowing a modern assessment of clinical utility and therefore recommendations to be made regarding their use in practice. Both overall survival and the chance of survival at 3-, 6- and 12-months from MPE diagnosis were assessed to allow consideration of the optimal output from the scores. In addition, we utilised our analysis to highlight potential areas limiting the predictive capabilities of the scores, and suggest possible improvements for the development of future MPE prognostic models.

METHODS

Ethics

Ethical and regulatory approval for the study was obtained through Health Research Authority (HRA) and Health and Care Research Wales (HCRW) Approval (REC reference number 24/HRA/1980).

Participants and Eligibility

Patients with MPE were identified through retrospective analysis of the Oxford Pleural Database. This is a comprehensive record of all patients discussed at the Oxford University Hospitals NHS Foundation Trust (OUH) pleural multi-disciplinary team (MDT) meeting since July 2015 (n = 2568). The OUH pleural MDT is a weekly meeting in which all patients managed by the pleural team at OUH are discussed on a case-by-case basis. For the current study, patients reviewed at the OUH pleural MDT between July 2015 - October 2023 with a final diagnosis of MPE had their electronic medical records screened. Patients were only excluded in the presence of key missing data, specifically insufficient baseline information to determine date of MPE diagnosis or insufficient follow-up information regarding length of survival. Patients were included in the absence of confirmatory pleural fluid cytology or pleural histopathology if a diagnosis of MPE was made following pleural MDT discussion. In these cases the diagnosis was based on radiological and clinical features, such as a large effusion with radiological characteristics suggestive of malignancy in the presence of known metastatic cancer.

Data Collection

Data were collected from the electronic patient records of identified individuals in April 2024, which was at least six months after the date of MPE diagnosis for all patients. Data collected included age, gender, date of MPE diagnosis, date of death (if applicable), causative cancer type, pleural fluid LDH, Eastern Cooperative Oncology Group Performance Status (ECOG PS), previous chemotherapy and radiotherapy, and baseline blood results, including neutrophils, lymphocytes, C-reactive protein (CRP), haemoglobin (Hb) and white cell count (WCC). For

patients with lung adenocarcinoma, the presence or absence of sensitising mutations (EGFR, ALK, ROS and BRAF) was recorded. Survival was calculated as the time from MPE diagnosis to the date of death. Patients were censored at the time of data collection or loss to follow-up. The LENT¹³ and clinical PROMISE¹⁴ scores at diagnosis were calculated and risk categories determined.

Statistical analysis

Descriptive statistics were expressed as frequency (percentages) for categorical variables and median (inter-quartile range (IQR)) for continuous variables. Kaplan–Meier survival curves were used to compare cumulative survival rates and log-rank (Mantel-Cox) tests were used to assess for differences between groups. For model discrimination, Cox regression was performed to compare relative survival, while receiver operating characteristic (ROC) curves and area under the ROC (AUROC) curves were used to calculate the C-statistic for mortality at specified timepoints. For model calibration, plots of the predicted versus observed mortality were produced, and the calibration slopes were calculated. The Brier and Nagelkerke's R^2 scores were calculated as general measures of model overall performance. All statistical tests were two-sided and statistical significance was set at $p < 0.05$. Missing data were handled through complete-case analysis for all tests. Statistical analyses were performed using IBM SPSS Statistics (Version 29.0.1.0), R (version 4.4.0)²² and SAS V 9.4 (SAS Institute; Cary, N Carolina).

Study Reporting

The study was reported following the Transparent Reporting of a multivariable prediction model for Individual Prognosis Or Diagnosis (TRIPOD) statement²³. Completed checklists are available in Appendix 1.

RESULTS

Cohort demographics and clinical characteristics

A total of 812 patients with MPE were identified. Of these, 39 (4.8%) had either inadequate baseline or follow-up information and were excluded. 390 of the remaining patients were female (50.5%), and 383 were male (49.5%) (Table 3). The median survival from MPE diagnosis was 158 days (IQR 58 - 533), and the median age at MPE diagnosis was 72 years (IQR 63 – 80). This was similar to the average age of the PROMISE development cohort (median 71 years), but marginally greater than that of the LENT score (mean 66 years). Causative malignancies in our cohort were also similar to the LENT and PROMISE development cohorts, with common cancer types including lung (28.6%), mesothelioma (21.1%), breast (16.9%), and malignancy of gastrointestinal (9.3%) or gynaecological origin (9.2%). In the majority of included patients the diagnosis was confirmed through cytology and/or histopathology (89.1%). The remaining patients were diagnosed with MPE based on radiological and clinical features following discussion at MDT. At the time of analysis, 681 (88.1%) of the included patients had died whilst 92 remained alive. Sufficient data was present to allow LENT score calculation in 699 patients (90.4%) and PROMISE score calculation in 636 patients (82.3%). Both scores could be calculated in 602 patients (77.9%). Median follow-up duration in our cohort was 157 days.

LENT and PROMISE score performance for overall survival

The median (IQR) lengths of survival for patients in the low-, moderate- and high-risk LENT categories were 705 (360-1728), 158 (70-429) and 42 days (20-79) respectively, while in PROMISE categories A-D they were 424 (192-1040), 104 (48-249), 57 (25-112) and 28 days (10-48). Survival experience by LENT and PROMISE categories is demonstrated in Figure 1.

Harrell's C-statistic was 0.72 (95% CI 0.70 – 0.74) and 0.73 (95% CI 0.71 – 0.75) for the LENT and PROMISE scores respectively.

LENT and PROMISE score performance for 3-, 6- and 12-month mortality

In addition to assessing likely overall survival, prognostic scores can also be utilised to predict the chance of patient survival at subsequent timepoints. We therefore assessed the ability of the LENT and PROMISE scores to predict survival at 3-, 6- and 12-months from MPE diagnosis. The proportion of patients in each LENT and PROMISE score category surviving at these timepoints is shown in Figure 2. Of note, the 3-month mortality proportions in this cohort were consistent with the outcomes predicted by the PROMISE score output¹⁴. Performance characteristics of the LENT and PROMISE scores at each timepoint are shown in Table 4. The AIC values, Brier scores and Nagelkerke's R² scores were calculated from patients in whom both scores were available to allow comparison, and, in general, the performance characteristics of the PROMISE score were marginally superior. Calibration plots for each time point are shown in Figure 3.

Evaluating the performance of variables used in the LENT and PROMISE scores

A. Cox regression

To evaluate the performance of the individual LENT and PROMISE score variables, univariate Cox regression models were constructed with each variable categorised as per their use in either the LENT or PROMISE score. With the exception of previous radiotherapy, all of the variables used in the scores were significantly associated with survival (Table 5). Multivariable Cox regression analyses with the combination of variables used in either the LENT or PROMISE scores were also conducted, with similar results to univariate analyses (Table 5).

B. Further analysis of tumour type

It has been suggested that the stratification of tumour types in the LENT and PROMISE scores does not sufficiently account for the biological variability of different malignancies^{17,18}. To investigate this in our cohort, patients were divided into groups of tumour type as per the LENT score (given that this allowed greater division compared to the PROMISE score) and the median (IQR) lengths of survival were calculated from Kaplan-Meier analysis (Table 6). It was notable that survival in those with haematological malignancy appeared markedly better than all other cancer types, and this was confirmed through log-rank tests. The survival of patients diagnosed with “other” malignancies was significantly worse than that of those diagnosed with lung cancer ($p = 0.001$).

In addition to inter-malignancy categorisation, it has also been suggested that consideration of tumour sub-types and sensitising mutations is lacking in the LENT and PROMISE scores^{24,25}. Using mesothelioma as an example, in our cohort the median survival in those with epithelioid mesothelioma was 473 days compared to 182 days in non-epithelioid sub-types ($p < 0.001$). A similar analysis was performed to compare the survival of lung adenocarcinomas to other lung cancer histological sub-types, with no significant difference ($p = 0.41$). We also investigated the impact of sensitising mutations in lung adenocarcinoma patients; 145 patients in our cohort had MPE secondary to lung adenocarcinoma with molecular testing results available. Of these, 28 (19.3%) had a sensitising mutation, mostly commonly in the EGFR gene ($n = 22$). The median length of survival was 356 days in those with a sensitising mutation compared to 126 days in those without ($p < 0.005$).

DISCUSSION

To date, the output from the LENT score has predominantly been in the form of median survival time, while the PROMISE score was developed to predict 3-month mortality. In the present

study, we assessed the performance of both scores to predict overall survival and the likelihood of survival at the pre-determined timepoints of 3-, 6- and 12-months.

In terms of overall survival, both scores showed predictive ability, with clear discrimination between the survival curves for their risk categories (Figure 1), and a Harrell's C-statistic of 0.72 and 0.73 for the LENT and PROMISE scores respectively. However, it was notable that while median survival for the moderate- and high-risk LENT categories was similar to those initially reported by Clive et al.¹³, the median survival of the low-risk category was markedly greater in our cohort (705 days vs 319 days). This indicates that the reported LENT score output for low-risk patients may significantly under-estimate survival time. Similar findings have been demonstrated in other LENT score validation studies, with Ermin et al.² finding median survival in their low-risk group to be 27 months, while in the study by Söyler et al.²⁶ this was 31 months. Furthermore, the IQRs for both scores, especially in the lower score categories, were extremely broad, a finding which is also notable from the initial LENT score publication¹³. Therefore, these scores are unlikely to be precise enough to convey meaningful information about 'average' survival time to patients outside the highest risk categories. This supports previous arguments from both clinicians and patients that median survival time is not a useful metric for individual patients or clinical decision-making^{27,28}.

An alternative form of outcome which can be provided by prognostic scores is the likelihood of survival at subsequent timepoints. The performance of the scores in predicting 3-, 6- and 12-month mortality in our cohort was strong²⁹, with C-indices around 0.8 for both at each timepoint, and the models appearing to be well-calibrated. These findings are comparable with previous assessments of LENT and PROMISE score performance^{18,24,30}. Alawneh et al.³⁰ performed a single-centre retrospective external validation of the LENT score in Jordan, and showed AUROC curves of 0.74, 0.78 and 0.79 for 1-, 3- and 6-month mortality respectively. Similarly, Wong et al.²⁴ found AUROC curves of 0.80 for the PROMISE score and 0.77 for the

LENT score for 3-month mortality in their evaluation in an Asian population. The chance of survival at pre-determined timepoints may therefore be a more useful, accurate and appropriate output for the scores than median survival time. Nonetheless, the form of prognostic information that is most understandable to patients must also be considered, and this may differ between individuals. There is currently a lack of evidence addressing this important issue and future research to provide greater clarity on the most patient-accessible output from prognostic scores would be beneficial. In terms of the choice between the two scores for predicting survival at pre-determined timepoints, the performance characteristics of the PROMISE score were marginally superior in our study (Table 4), yet the variables required for LENT score calculation are often more readily available. Therefore, the use of either score would be appear acceptable.

Given that we have shown that both scores carry predictive ability for survival in MPE, it is important to consider how these models should be used in practice. It is crucial to offer meaningful prognostic information to patients with advanced malignancy to reduce the distress caused by prognostic uncertainty¹¹, and we would advocate use of the scores for this purpose. The scores may also be useful in determining the appropriateness of patients for inclusion in clinical trials. However, the utility of the scores as an aid to clinical decision-making is currently unclear. While MPE guidelines suggest temporising treatments such as thoracentesis in patients with short life expectancy^{1,10}, in practice this is typically only applied to those with extremely poor prognosis, and in remaining individuals the decision surrounding management (e.g. talc pleurodesis vs IPC insertion) is predominantly led by patient preference rather than options to alter survival³¹. This limited requirement to stratify individuals to different treatment options based on prognosis likely reflects a key reason for the lack of uptake of the scores amongst clinicians. However, it may be that in the near future MPE-specific pharmacological options become available, at which point the clinical utility of prognostic scores will increase. For

instance, intrapleural immunotherapeutic^{32,33} and antiangiogenic³⁴ agents are currently being investigated, with promising initial results.

The aim of the current study was to externally evaluate the performance of the LENT and PROMISE scores, rather than develop a new prognostic model. Nonetheless, our results highlight a number of areas which developers of future MPE prognostic scores should consider. Firstly, we demonstrate through Cox models that, with the exception of previous radiotherapy, each of the variables used in the LENT and PROMISE scores should be assessed for inclusion in future scores. Secondly, we show that the presence of sensitising mutations in the underlying primary malignancy should be considered. Taking lung adenocarcinoma as an example, in this cohort we found that those with sensitising mutations experienced significantly longer survival than those without, likely reflecting the survival benefit introduced by treatment with targeted therapies such as tyrosine kinase inhibitors²¹. This supports previous work demonstrating that in areas with high prevalence of EGFR mutation, the performance of the LENT score can be improved by re-scoring lung adenocarcinomas from the highest to the lowest risk category (EGFR-LENT)²⁴. Our results also suggest that further stratification of tumour types may improve model performance. For instance, patients with non-epithelioid mesotheliomas had significantly shorter survival in this cohort than those with an epithelioid sub-type, indicating that grouping these may limit predictive ability. In fact, given the heterogeneity in outcomes between malignancies it has previously been suggested that tumour-specific prognostic scores for MPE are required^{17,18}. An example of such an approach is seen with the recently developed Breast and Lung Effusion Survival Score (BLESS)¹⁷, which outperformed the LENT score in the validation cohort but has not been externally validated. Finally, future model creators should consider alternative approaches to the use of continuous variables. In both the LENT and PROMISE scores continuous variables have been categorised (LDH and NLR in the LENT score, CRP, WCC and Hb in the PROMISE score), likely due to a non-linear relationship

between the variables and the outcome. However, this causes substantial information loss from the models and imposes arbitrary cut-offs between categories that have no biological basis^{35,36}. Techniques to allow the use of such variables as continuous have been developed and validated, including cubic splines, and these should be considered in future MPE model development^{37,38}.

Strengths and limitations

A particular strength of this study is the size of patient cohort and the relatively small amount of data loss. To the best of our knowledge, this is the largest cohort to externally assess the performance of the LENT and PROMISE scores to date. In addition, the analysis was conducted using patients diagnosed with MPE over a considerable time period, and until the end of 2023. A key concern with prognostic scores is that their performance may diminish over time with changing healthcare practice and patient demographics⁹, yet despite our timeframe including significant advancements in the use of immunotherapy in lung cancer¹⁹ and mesothelioma²⁰, the performance of the scores appears to remain strong.

Notable limitations include data collection at a single-centre tertiary hospital, which may limit the generalisability of our findings to other healthcare settings, and the retrospective nature of the study. Whilst ideally prospective studies would be performed, due to the relatively low incidence of MPE such studies would take a long time to recruit, and therefore retrospective cohort studies are an appropriate methodology. Also, this evaluation has not considered all prognostic models developed for MPE. Over recent years a number of additional scores have been published, including the tumour-specific BLESS¹⁷ and CAIL¹⁸ scores, and further ‘one-size-fits-all’ scores such as SELECT²¹, EGFR-LENT²⁴ and modified-LENT³⁹. We focussed on the LENT and PROMISE scores in this study as the two most prominent models published to date, and to allow inclusion of all tumour types in the analysis. However, these newer scores

address some of the limitations with the LENT and PROMISE scores that we have highlighted in this study, and their external validation is therefore certainly warranted.

CONCLUSION

In this cohort both the LENT and PROMISE scores demonstrated predictive ability for overall survival, yet the precision of median survival estimates was lacking. The scores are likely to be more useful in determining the chance of survival at specified timepoints, with both scores showing strong performance at the intervals assessed. However, it appears that there is scope for performance of the scores to be improved through greater stratification of tumour types, consideration of sensitising mutations, and the inclusion of appropriate variables as continuous. Currently, the utility of the LENT and PROMISE scores will predominantly be in the provision of prognostic information to affected individuals, however as more MPE-specific therapeutic options become available, prognostic scores to stratify patients to different treatments may be required.

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CONFLICT-OF-INTEREST DISCLOSURE

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Tables

Table 1. LENT score calculation and risk categories. Abbreviations: LDH, lactate dehydrogenase; ECOG PS, Eastern Cooperative Oncology Group Performance Status; NLR, neutrophil-to-lymphocyte ratio; RCC, renal cell carcinoma.

Variable	Score
Pleural fluid LDH (U/L)	
<1500	0
>1500	1
ECOG PS	
0	0
1	1
2	2
3-4	3
NLR	
<9	0
>9	1
Tumour type	
Mesothelioma or haematologic	0
Breast, gynaecologic or RCC	1
Lung or other	2
Risk category (score)	Estimated median survival (days)
Low risk (0-1)	319
Moderate risk (2-4)	130
High risk (5-7)	44

Table 2. Clinical PROMISE score calculation and risk categories. Abbreviations: ECOG PS, Eastern Cooperative Oncology Group Performance Status.

Variable	Score
Previous chemotherapy	
No	0
Yes	4
Previous radiotherapy	
No	0
Yes	2
Haemoglobin (g/dL)	
>16	0
14 to <16	1
12 to <14	2
10 to <12	3
<10	4
White cell count (10 ⁹ cells/L)	
<4	0
4 to <6.3	2
6.3 to <10	4
10 to <15.8	7
>15.8	10
C-reactive protein (IU/L)	
<3	0
3 to <10	3
10 to <32	5
32 to <100	8
>100	11
ECOG PS	
0-1	0
2-4	7
Tumour type	
Mesothelioma	0
Other	4
Lung	5
Risk Category (score)	3-month mortality risk
A (0-20)	<25%
B (21-27)	25-<50%
C (28-35)	50-<75%
D (>35)	≥75%

Table 3. Patient Demographics and Clinical Characteristics. Abbreviations: IQR, inter-quartile range; ECOG PS, Eastern Cooperative Oncology Group Performance Status.

Characteristic	N (%) or Median (IQR)
Age	72 (63-80)
Sex	
Female	390 (50.5)
Male	383 (49.5)
Primary Cancer	
Lung	221 (28.6)
Adenocarcinoma	177
Small cell	21
Squamous cell	15
Unspecified	8
Mesothelioma	163 (21.1)
Epithelioid	115
Biphasic	26
Sarcomatoid	17
Unspecified	5
Breast	131 (16.9)
Gastrointestinal	72 (9.3)
Pancreatic	23
Oesophageal	22
Colorectal	15
Cholangiocarcinoma	7
Gastric	5
Gynaecological	71 (9.2)
Haematological	33 (4.3)
Sarcoma	17 (2.2)
Renal cell	16 (2.1)
ECOG PS	
0	134 (17.7)
1	296 (39.0)
2	175 (23.1)
3-4	154 (20.3)
LENT Category	
Low	125 (17.9)
Moderate	437 (62.5)
High	137 (19.6)
PROMISE Category	
A	272 (42.8)
B	190 (29.9)
C	153 (24.1)
D	21 (3.3)
Previous Chemotherapy	
Yes	183 (30.4)
No	419 (69.6)
Previous Radiotherapy	
Yes	148 (24.6)
No	454 (75.4)

Table 4. Performance characteristics of the LENT and clinical PROMISE scores for 3-, 6- and 12-month mortality. Abbreviations: AIC, Akaike information criterion; CI, confidence interval.

	3-month	6-month	12-month
LENT Score			
C statistic (95% CI)	0.79 (0.76-0.83)	0.80 (0.76-0.83)	0.82 (0.78-0.85)
Calibration slope (95% CI)	1.00 (0.83-1.17)	1.00 (0.84-1.16)	1.00 (0.83-1.17)
Brier score	0.175	0.176	0.149
Nagelkerke's R ²	0.325	0.372	0.366
AIC	632.8	634.2	540.2
PROMISE Score			
C statistic (95% CI)	0.82 (0.78-0.85)	0.81 (0.78-0.84)	0.82 (0.78-0.85)
Calibration slope (95% CI)	1.00 (0.83-1.17)	1.00 (0.83-1.17)	1.00 (0.82-1.18)
Brier score	0.165	0.174	0.150
Nagelkerke's R ²	0.388	0.379	0.352
AIC	595.2	629.3	548.1

Table 5. Cox regression analyses of survival time on the individual variables used in the LENT and/or PROMISE scores. Abbreviations: ref, reference; HR, hazard ratios; CI, confidence intervals; LDH, lactate dehydrogenase; NLR, neutrophil-lymphocyte ratio; ECOG PS, Eastern Cooperative Oncology Group Performance Status; Hb, haemoglobin; CRP, C-reactive protein; WCC, white cell count.

Variable (ref)	Univariable analysis		Multivariable analysis			
	HR (95% CI)	p-value	HR (95% CI) – LENT variables	p-value	HR (95% CI) – PROMISE variables	p-value
LDH > 1500U/L	1.55 (1.20-2.01)	<0.001	1.38 (1.06-1.80)	0.016		
NLR > 9	2.05 (1.72-2.45)	<0.001	1.52 (1.26-1.85)	<0.001		
Tumour score (0)		<0.001		<0.001		<0.001
1	1.30 (1.05-1.61)		1.40 (1.11-1.77)		1.10 (0.84-1.44)	
2	2.67 (2.20-3.25)		2.64 (2.12-3.28)		2.35 (1.86-2.95)	
ECOG PS (0)		<0.001		<0.001		<0.001
1	1.74 (1.37-2.21)		1.54 (1.20-1.98)		1.48 (1.13-1.95)	
2	3.05 (2.36-3.95)		2.57 (1.95-3.37)		2.49 (1.84-3.37)	
3	5.85 (4.46-7.66)		4.61 (3.43-6.20)		5.01 (3.62-6.94)	
4	8.66 (4.83–15.52)		9.61 (5.19-17.96)		11.80 (5.89-23.63)	
Hb (g/dL) (≥16)		<0.001				0.006
14 to <16	1.10 (0.62-1.93)				1.64 (0.90-3.00)	
12 to <14	1.26 (0.72-2.20)				1.45 (0.80-2.62)	
10 to <12	2.04 (1.16-3.58)				1.71 (0.94-3.11)	
<10	1.91 (1.05-3.47)				0.98 (0.52-1.86)	
CRP (IU/L) (<3)		<0.001				<0.001
3 to <10	1.35 (0.92-1.97)				1.09 (0.72-1.64)	
10 to <32	1.91 (1.34-2.73)				1.41 (0.96-2.06)	
32 to <100	2.73 (1.95-3.83)				2.28 (1.56-3.34)	
≥100	4.82 (3.39-6.85)				3.88 (2.57-5.85)	
WCC (10⁹ cells/L) (<4)		<0.001				0.003
4 to <6.3	0.65 (0.38-1.12)				1.03 (0.52-2.02)	
6.3 to <10	0.87 (0.52-1.46)				0.97 (0.51-1.83)	
10 to <15.8	1.02 (0.60-1.73)				0.92 (0.48-1.78)	
≥15.8	1.86 (1.06-3.27)				1.70 (0.86-3.37)	
Previous chemotherapy	1.25 (1.06-1.48)	0.008			1.25 (1.00-1.55)	0.049
Previous radiotherapy	1.07 (0.90-1.27)	0.46			1.20 (0.95-1.52)	0.13

Table 6. Average length of survival by LENT score malignancy categorisation. Abbreviations: LOS, length of survival; IQR, inter-quartile range.

Malignancy	Median LOS (days)	IQR
Mesothelioma	293	108.5-659.8
Haematological	1326	350-
Breast	295	70-1041
Gynaecological	241	80-549
Renal cell carcinoma	55	35-214
Lung	112	44-271
Other	64	36-140

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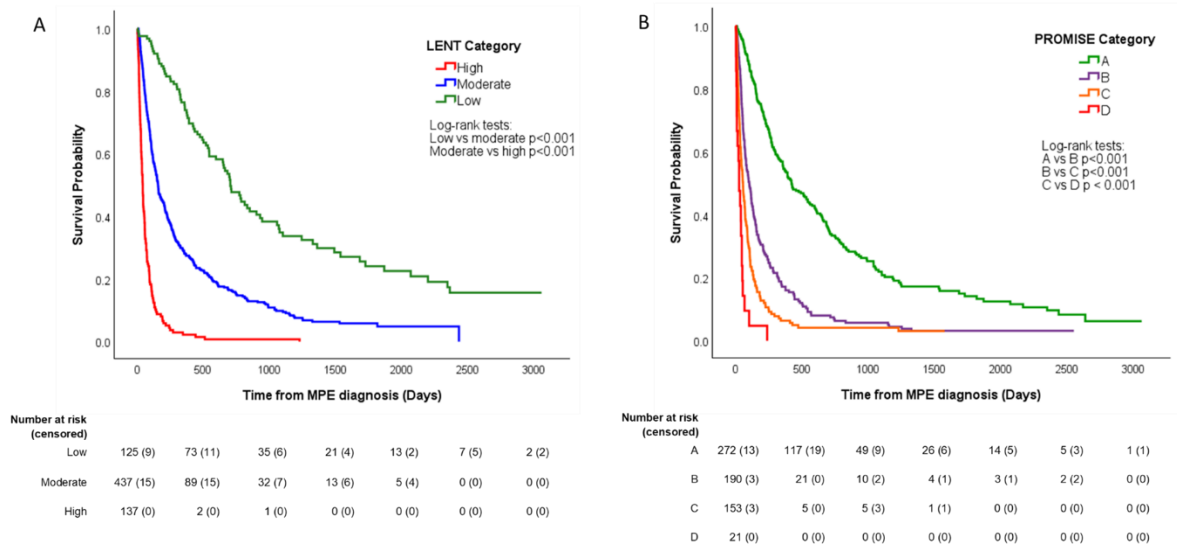


Figure 1

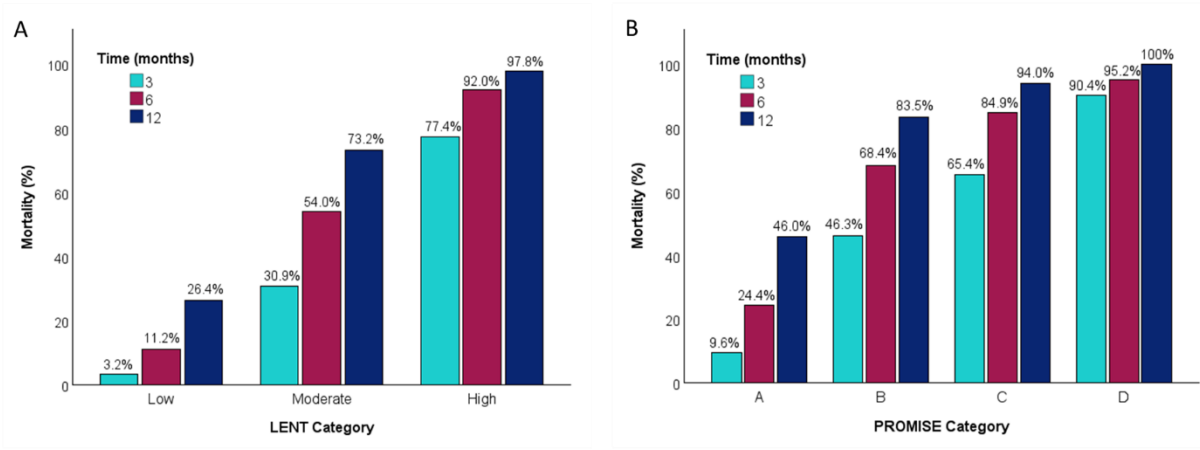


Figure 2

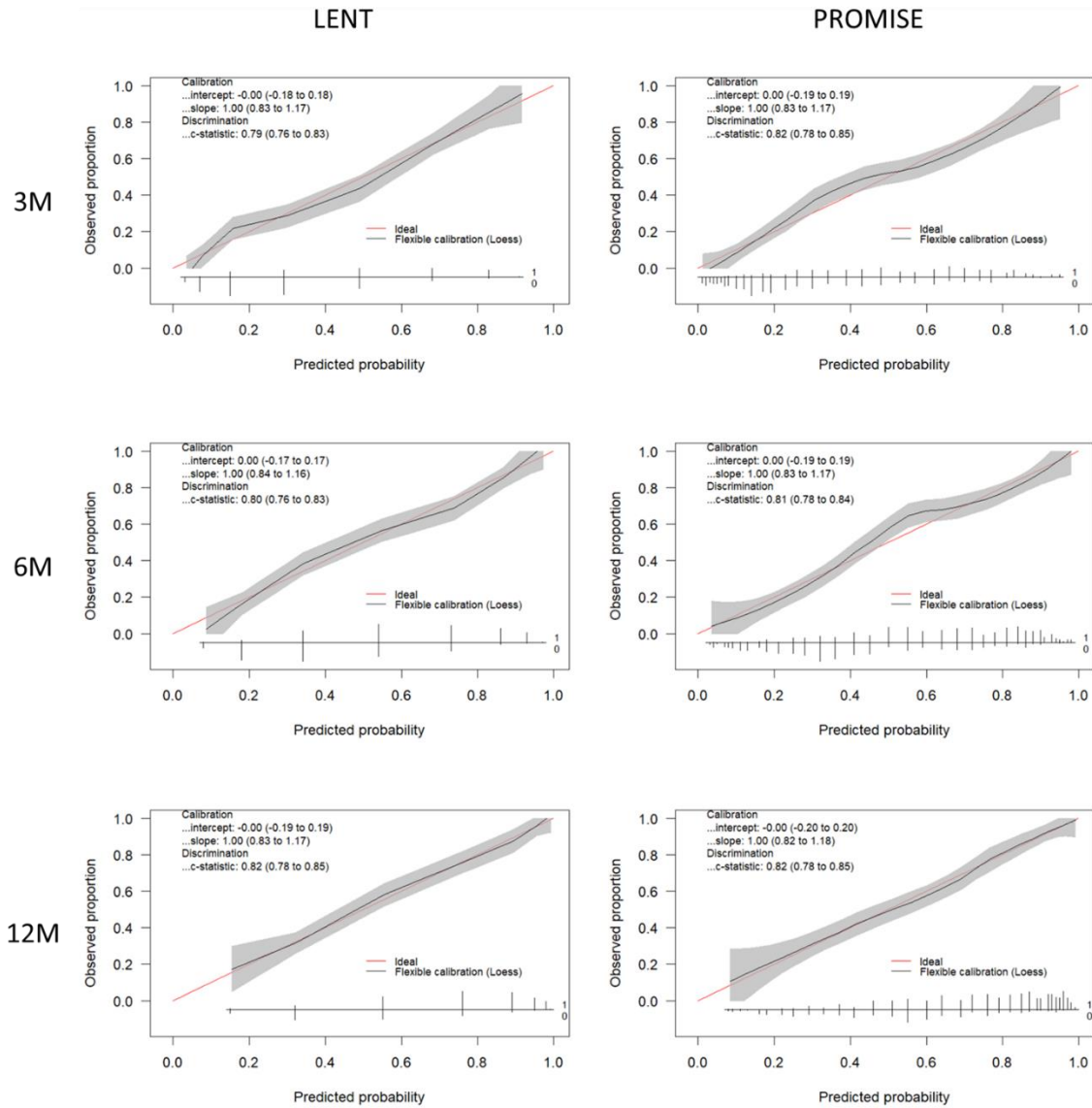


Figure 3