**Results**

~~The inclusion criteria designated in materials and methods gave a sample set of 34 patients from the original 102 previously described [6]. The cohort was representative of this original patient set except that the male:female ratio was inverted (Table 1). In agreement with the published cohort, our sample set was enriched for cases with extracapsular spread (i.e. poor prognosis) in comparison to the general HNSCC population (Rogers et al., Oral Oncology 2009). Of these 34 patients, 24 remained alive 12 months after surgery, while 19 survived to two years.~~

<TABLE 1>

**~~Table 1~~**~~: Clinicopathological and outcome data of the current cohort~~

Utilising the Mantel Cox log rank test to define patients with the highest risk of death based on outcome data alone, defined the group of 9 patients who did not survive 12 months as a separate, high risk, cohort (Figure 2). Survival at 12 months was therefore taken as our timepoint for further analysis.

<FIGURE 2>

**Figure 2**. Mantel Cox log rank test to discriminate between higher and lower risk cohorts

A total of 205,701 FTIR spectra were obtained from the 24 patients who survived beyond one year and 96,402 spectra were obtained from 10 patients who died within 12 months. After modelling these data in 100 different train/test iterations using PCA and linear regression, as described in materials and methods, the mean AUC (area under the receiver operating characteristic curve) was shown to be 0.63 (Figure 3A) and incorporation of the ASMA data into this analysis, increased the AUC to 0.70. Although the precision decreased with recall, the overall curve suggested that the data was sufficiently balanced to accept the model (Figure 3B). Furthermore, additional classification statistics produced comparable conclusions, showing that the model was a good predictor of poor outcome (Figure 3 C-H) with median specificity of ? and sensitivity of ?.

<FIGURE3> = an amalgamation of current figure 2 (ROC/PR curves) and figure 3 (box and whisker plots)

**Figure 2**. Classification statistics for the modelling of survival at one year using IR data alone (orange) and FTIR supplemented with ASMA data (blue).

A: ROC curve; B: PR curve; C-H: box and whisker plots of: AUC (C); Matthews Correlation Coefficient (MCC)(D); specificity (E); sensitivity (F); positive predictive value (PPV)(G); and negative predictive value (NPV)(H). Coloured boxes show the area enclosed by the 25th and 75th percentiles with the median shown as a bar. Whiskers indicate the 90th percentile.

Kaplan-Meier survival curves obtained from the mean curves of 100 test/train iterations of the model show a clear difference in survival between subsets of data defined by their IR signature.

<FIGURE 4> (use an x-axis scale of perhaps 24 months max?)

**Figure 4**: Kaplan-Meier survival curves showing mean survival curves predicted

across all test/train iterations. FTIR + ASMA (A), FTIR(B). Survival

curves shown in orange (blue) indicate patients predicted to have survived

beyond (within) one year

Furthemore, each pair of survival curves for each train/test iteration was subject to a log-rank (Mantel-Cox) test to compare overall survival between the predicted outcomes. At all iterations, the test gave a significance of p < 0:001, strengthening the conclusion that a difference between the two survival curves exists.

Add data analysis at the patient level.