ONCOPOOL database (n = 17,000) is of primary operable breast cancers in women aged ⩽70, from 12 European Breast Units, treatment in 1990–99.

Method: LVI was regularly measured in 4 units (n = 5195) on H & E staining. Scoring was to positive or negative. 20% were LVI+.

Results:

A. Relation to Nottingham Prognostic Index (NPI). A highly significant rank order, 7% LVI+ lying in Excellent NPI group to 60% in the poor groups.
B. Effect on survival – breast cancer specific (BCS)

	LN STAGE	LVI	n	LN/LVI group	10 year BCS%		p
1	LN Neg	Neg	2359	1	86 ± 1	}	<.000
2	LN Neg	Pos	429	2	78 ± 3		
	LN 1 Pos	Neg	413		80 ± 2	}	=.025
3	LN 1 Pos	Pos	245	3	73 ± 4		
	LN 2-3 Pos	Neg	307		72 ± 3	}	=.25
4	LN 2-3 Pos	Pos	266	4	65 ± 4		
	LN 4+ Pos	Neg	574		69 ± 2	}	<.000
5	LN 4+ Pos	Pos	508	5	44 ± 3		

Conclusion: LVI positivity by its effect on LN stage lowers survival within all Nottingham Prognostic Index (NPI) groups.

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O-69 PREDICTING THE PROBABILITY OF OUTCOME IN BREAST CANCER – A COMPARISON OF DIFFERENT MACHINE LEARNING METHODS

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Introduction: As clinicians we are commonly asked by patients 'what is my chance of surviving breast cancer?' In recent years numerous attempts have been made to utilise both machine learning methods and large datasets to develop new tools to predict survival. The aim of our study was to firstly compare the performance of a number of these models and secondly to introduce a new model that provides a simple means of predicting the probability of survival.

Methods: The Surveillance, Epidemiology, and End Results (SEER) data was used to build a data set of women diagnosed with breast cancer between 1990 and 1997. We used the statistical packages *R* and Weka to generate the models based on tumour size, grade and nodal involvement. Methods applied were: support vector machines, decision trees, boosting, bagging, random forests and Naïve Bayes Decision Tree (NBTree).They were validated using 10-fold cross validation.

Results: A total of 50,895 women were included in the analysis. Each model was generated 10 times, validated and then tested. The best performing model was Random forests with the ability to correctly predict the outcome in 70.56%. The NBTree model was the second best performing model (69.26%) which also provided a probability for ten year survival.

Conclusion: Although the random forests model was the most robust model, from a clinicians point of view, the NBTree model produced a decision tree that can easily be integrated into patient care and that also puts a value on the probability of survival.

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O-70 COMPARISON OF PREDICT AND ADJUVANT! PROGNOSTICATION MODELS FOR EARLY BREAST CANCER IN A UK DATASET

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Aim: We have recently developed and validated a prognostication model (PREDICT), that predicts overall survival for women treated for early breast cancer in the UK, based on cancer registry data.[1] We have now compared the mortality prediction from PREDICT against Adjuvant! in an independent UK dataset.

Method: 10-Year overall survival (OS) and breast cancer-specific survival (BCSS) data were available for 1065 women treated at the Churchill Hospital in Oxford between 1986 and 1996. 10-Year predictions for OS and BCSS from PREDICT and Adjuvant! were compared with the observed 10-year outcomes for these patients.

Results: Of the 1065 cases, 891 had optimal breast cancer surgery that included radiotherapy following breast conserving surgery and adequate axillary staging. The results are shown in the Table.

	Actual mortality	PREDICT	Adjuvant!
All cause mortality	234	199	191
Breast cancer specific mortality	161	151	133

Conclusion: In this UK dataset, PREDICT performed better than Adjuvant! for both OS and BCSS. For breast cancer specific mortality, PREDICT's estimate was within 1% of actual mortality compared to a 3% difference for Adjuvant! Further comparisons in other datasets are ongoing.

Reference:

1. Wishart GC, Azzato EM, Pharoah PDP, Greenberg DC, Rashbass O, Kearins O, et al. PREDICT: a new UK prognostic model that predicts survival following surgery for invasive breast cancer. *Breast Cancer Res* 2010;**12**(1):R1.

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O-71 RESCORING OF GRADE AND RE-EVALUATION OF THE NOTTINGHAM PROGNOSTIC INDEX (NPI) USING COMPONENTS OF ELSTON ELLIS GRADE AND ADDING LYMPHO-VASCULAR INVASION

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Elston–Ellis grading has wide acceptance. Scores are 1–3 for each of Tubules Pleomorphism and Mitoses (TPM). These added (3–5, 6–6, 7–9) give 3 ('original') grades.

1. *Inter-unit consistency:*In ONCOPOOL only five recorded T, P and M on all. Inter-unit consistency was poor: ranges for G1 19–43%; G2 24–42 and G3 19–53.Cox analysis for survival showed P non-significant. Using only T and M gives five 'revised' grades: with ranges G1 4–14%, G2 16–21, G3 25–27, G4 18–21, G5 18–24.
2. *Re-evaluation of the Nottingham Prognostic Index (NPI) using 'revised' grade and adding lympho-vascular invasion (LVI)*Nottingham City Hospital data set, treated by primary operative therapy in 1990–1999 (n = 2238).

Effect on survival of revised grade, LN stage, size and LVI (Cox regression):

	Beta	p-Value
Size cm (0.5–5)	.2	.000
T (1–3)	.3	.003
M (1–3)	.45	.000
LN stage (1–3)	.6	.000
LVI (1–2)	.35	.001

This gives a formula for 'revised NPI': (LN stage 1–3 × 1.8) + (M 1–3 × 1.5) + (T 1–3) + (LVI 1–2). As in the original NPI the major contributions are made by LN stage and grade. Size contribution is larger than in original, the addition of LVI makes the smallest contribution.

Comparison in the same data set between survivals according to new and original NPI's showed that 17% of individuals moved down by one group, 21% moved up by one group and 0.4% by more than one, amending predicted individual 10 year survivals in 38% of individuals by up to 13%.

Conclusion: Revised grade gives much better consistency between units and can be applied to retrospective analyses.

The revised formula for NPI gives better prediction for the individual.

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O-72 REMODELING THE NOTTINGHAM PROGNOSTIC INDEX (NPI) FOR INDIVIDUAL PROGNOSIS

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The Nottingham Prognostic Index (NPI) is a widely used tool for determining a prognostic outcome classification for women with breast cancer. The aim of this study is to remodel the NPI for individual prognosis at a particular time point.

The original formula NPI = grade + stage + 0.2* size was used to calculate a score that classified a case into one of six classes.

Recent work has progressed the NPI calculation to determine, using polynomial functions, the probability of survival to 10 years based on use of the NPI as a continuous variable.

Here we present further development of this work based on the Nottingham Case series (1990–1999, size < 5 cm, age <70, primary operable breast tumours, 2215 cases). Further analysis conducted has developed a number of functions that allow calculation of a probability of survival at any time point up to 15 years for a given NPI score. This modeling is presented in Fig. 1. Furthermore this function has been remodeled to

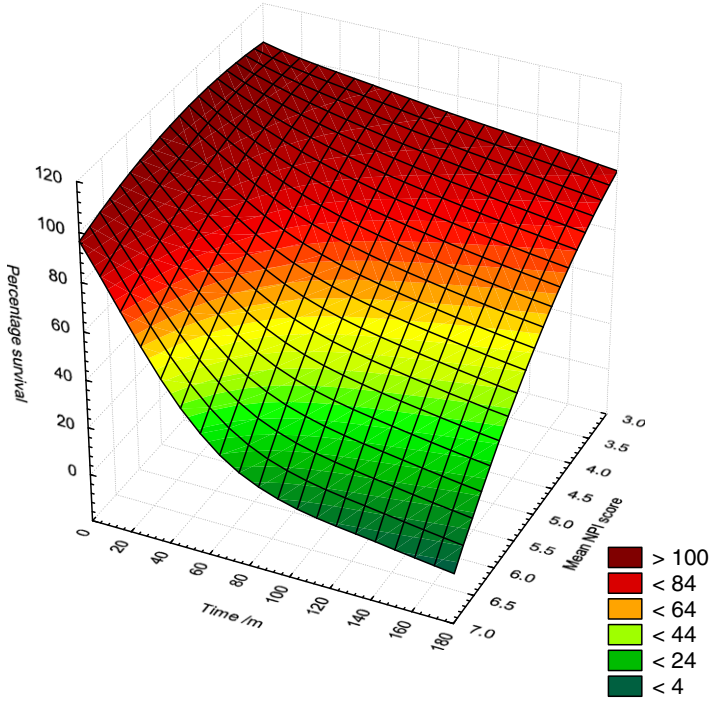

Fig. 1. Modeling of the NPI, relating probability of survival at a particular time to the calculated NPI value.