Summary

Background:
The number of people with diabetes is increasing globally and consequently so too is diabetic retinopathy. Most patients with diabetes are monitored through the diabetic eye screening programme until they have signs severe enough for referral into hospital eye services (HES). Due to current pressures on HES, delays can occur, leading to harm. We previously developed a prediction model using data from primary care to identify patients with referable diabetic retinopathy at high risk of treatment or vision loss by 2 years (DRPTVL-UK).

Aim and Objectives:
To externally validate the DRPTVL-UK model in a secondary care setting, in a population under the care of hospital eye services, and to update the model by considering additional predictors not previously available.

Data sources:
Routinely collected secondary care data from three NHS trusts (South Tyneside and Sunderland, Surrey & Sussex, and Greater Glasgow and Clyde) for all patients with referable diabetic retinopathy within the catchment areas of these three service providers were utilised.

Methods
The DRPTVL-UK model was externally validated for risk of treatment or vision loss by 2 years within each of the three NHS trust datasets. The model was updated through re-calibrating the baseline risk and developing an updated model with visual acuity as an additional predictor (in addition to predictors included in original model) and refitted using Cox proportional hazards regression to the Sunderland, Surrey & Sussex, and Glasgow datasets (separately for each dataset). Performance was assessed using measures of discrimination (C-statistic), calibration (calibration slope, calibration plots) and net benefit (decision curves).

Results
DRPTVL-UK only had fair performance in the validation populations (Harrell's C statistic of 0.69 (0.66 to 0.72) in Sunderland, 0.70 (0.66 to 0.75 in Sussex and 0.55 (0.52 to 0.57) in Glasgow. The updated models resulted in moderate discrimination (Harrell's C index of 0.71 (0.69 to 0.74) in Sunderland, 0.77 (0.73 to 0.80) in Sussex and 0.67 (0.65 to 0.70) in Glasgow). The calibration slope of the DRPTVL-UK for Sunderland was 0.32 (0.26 to 0.38), 0.87 (0.68 to 1.05) for Sussex and 0.18 (0.07 to 0.30) for Glasgow. The slope of the updated models was 0.91 (0.78 to 1.03) in Sunderland cohort, 0.90 (0.78 to 1.01) in Sussex cohort and 1.00 (0.84 to 1.16) in Glasgow. The updated models had higher net benefit compared to the original model but lower than treat all or treat none, models in both trusts.

Conclusion
The original model did not perform as well as hoped for in the hospital datasets, even when we updated it with some additional information. We think this is because the characteristics of the patients in the different datasets we used were quite different and that these differences were not being captured well by the variables in the model. We need to do more work to understand these differences and capture them in a revised generalisable model.