

External validation of prognostic models to predict pre-eclampsia: An Individual Participant Data Meta-analysis

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Background

With about 70 published prognostic models, pre-eclampsia is the most frequently predicted outcome in obstetrics, yet only 10% have been externally validated,¹ and none are recommended in national guidelines for routine clinical use, partly due to a paucity in external validation.

Access to individual participant data (IPD) from multiple studies allows for external validation in different populations. It saves cost by reusing existing data thereby reducing research waste, and increases the sample-size with more outcomes beyond what would have been possible in a single study, allowing for evaluation of prediction models of rare conditions, such as early-onset pre-eclampsia, which affects only 0.5% of all pregnancies.

Aims

To assess the external predictive performance of existing prognostic models for pre-eclampsia within the UK healthcare setting.

Methods

Systematic review and external validation of prognostic models using IPD meta-analysis. Performance was evaluated using measures of discrimination, calibration and net-benefit. Random-effects meta-analysis was used to summarise and estimate heterogeneity in model performance across studies.

Results

IPD from 11 UK cohort studies (217,415 pregnant women) within the International Prediction of Pregnancy Complications network^[2] were used for external validation. Medline and Pubmed searches up to December 2017 identified 71 articles, describing the development of 131 prognostic models for predicting pre-eclampsia. Half (51%, 67/131) provided the full model equations required for validation, but only a third (36%, 24/67) could be validated because all predictors in the model were recorded in at least one study of the IPD. Summary C-statistics were modest (0.6-0.7) and calibration was generally poor (<1) suggesting overfitting.

Conclusions

Evidence is limited to support the implementation of evaluated models in clinical practice. Findings suggests methodological failings in their development.

Keywords

Pre-eclampsia, external validation, prediction model, individual participant data

References

^[1]Kleinrouweler CE, et al. Prognostic models in obstetrics. *AJOG* 2015.

^[2]Allotey J, et al. External validation, update and development...the IPPIC pre-eclampsia Network protocol. *DAPR* 2017;1:16.