

TRIPOD Checklist: Prediction Model Development and Validation

Section/Topic	Item	Checklist Item	Page
Title and abstract			
Title	1	D;V Identify the study as developing and/or validating a multivariable prediction model, the target population, and the outcome to be predicted.	1
Abstract	2	D;V Provide a summary of objectives, study design, setting, participants, sample size, predictors, outcome, statistical analysis, results, and conclusions.	3
Introduction			
Background and objectives	3a	D;V Explain the medical context (including whether diagnostic or prognostic) and rationale for developing or validating the multivariable prediction model, including references to existing models.	4
	3b	D;V Specify the objectives, including whether the study describes the development or validation of the model or both.	4
Methods			
Source of data	4a	D;V Describe the study design or source of data (e.g., randomized trial, cohort, or registry data), separately for the development and validation data sets, if applicable.	4-5
	4b	D;V Specify the key study dates, including start of accrual; end of accrual; and, if applicable, end of follow-up.	23-24 Appendix Table 1
Participants	5a	D;V Specify key elements of the study setting (e.g., primary care, secondary care, general population) including number and location of centres.	5-6
	5b	D;V Describe eligibility criteria for participants.	5-6
	5c	D;V Give details of treatments received, if relevant.	N/A
Outcome	6a	D;V Clearly define the outcome that is predicted by the prediction model, including how and when assessed.	6
	6b	D;V Report any actions to blind assessment of the outcome to be predicted	N/A
Predictors	7a	D;V Clearly define all predictors used in developing or validating the multivariable prediction model, including how and when they were measured.	6-7
	7b	D;V Report any actions to blind assessment of predictors for the outcome and other predictors.	6
Sample size	8	D;V Explain how the study size was arrived at.	7
Missing data	9	D;V Describe how missing data were handled (e.g., complete-case analysis, single imputation, multiple imputation) with details of any imputation method.	7
Statistical analysis methods	10a	D Describe how predictors were handled in the analyses.	7-8
	10b	D Specify type of model, all model-building procedures (including any predictor selection), and method for internal validation.	7-8
	10c	V For validation, describe how the predictions were calculated.	7-8
	10d	D;V Specify all measures used to assess model performance and, if relevant, to compare multiple models.	7-8
	10e	V Describe any model updating (e.g., recalibration) arising from the validation, if done.	N/A
Risk groups	11	D;V Provide details on how risk groups were created, if done.	N/A
Development vs. validation	12	V For validation, identify any differences from the development data in setting, eligibility criteria, outcome, and predictors.	7
Results			
Participants	13a	D;V Describe the flow of participants through the study, including the number of participants with and without the outcome and, if applicable, a summary of the follow-up time. A diagram may be helpful.	9
	13b	D;V Describe the characteristics of the participants (basic demographics, clinical features, available predictors), including the number of participants with missing data for predictors and outcome.	9; 16-17
	13c	V For validation, show a comparison with the development data of the distribution of important variables (demographics, predictors and outcome).	16-17 (Table 1)
Model development	14a	D Specify the number of participants and outcome events in each analysis.	9
	14b	D If done, report the unadjusted association between each candidate predictor and outcome.	N/A
Model specification	15a	D Present the full prediction model to allow predictions for individuals (i.e., all regression coefficients, and model intercept or baseline survival at a given time point).	9; 18-21
	15b	D Explain how to use the prediction model.	9; 18-19
Model performance	16	D;V Report performance measures (with CIs) for the prediction model.	9-10; 18-21
Model-updating	17	V If done, report the results from any model updating (i.e., model specification, model performance).	9-10; 18-21
Discussion			
Limitations	18	D;V Discuss any limitations of the study (such as nonrepresentative sample, few events per predictor, missing data).	11-12
Interpretation	19a	V For validation, discuss the results with reference to performance in the development data, and any other validation data.	10-11
	19b	D;V Give an overall interpretation of the results, considering objectives, limitations, results from similar studies, and other relevant evidence.	10-12
Implications	20	D;V Discuss the potential clinical use of the model and implications for future research.	11-12
Other information			
Supplementary information	21	D;V Provide information about the availability of supplementary resources, such as study protocol, Web calculator, and data sets.	23-31
Funding	22	D;V Give the source of funding and the role of the funders for the present study.	2

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*Items relevant only to the development of a prediction model are denoted by D, items relating solely to a validation of a prediction model are denoted by V, and items relating to both are denoted D;V. We recommend using the TRIPOD Checklist in conjunction with the TRIPOD Explanation and Elaboration document.