

## TRIPOD Checklist: Prediction Model Development and Validation

Section	Item		Checklist description	Reported on Page Number/Line Number	Reported on Section/Paragraph
<b>Title and abstract</b>					
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.	Page 1, Line 3–4	Title
Abstract	2	D;V	Provide a summary of objectives, study design, setting, participants, sample size, predictors, outcome, statistical analysis, results, and conclusions.	Page 2, Line 44–66	Abstract
<b>Introduction</b>					
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.	Page 4, Line 98–136	Introduction, Paragraph 1
	3b	D;V	Specify the objectives, including whether the study describes the development or validation of the model or both.	Page 5, Line 128–136	Introduction, Paragraph 3
<b>Methods</b>					
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.	Page 5, Line 139–172	Methods, Paragraph 4
	4b	D;V	Specify the key study dates, including start of accrual; end of accrual; and, if applicable, end of follow-up.	Page 5, Line 144–147	Methods, Paragraph 5
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.	Page 5, Line 139–172	Methods, Paragraph 4
	5b	D;V	Describe eligibility criteria for participants.	Page 5, Line 154–158	Methods, Paragraph 6
	5c	D;V	Give details of treatments received, if relevant.	Page 5, Line 144–147	Methods, Paragraph 5
Outcome	6a	D;V	Clearly define the outcome that is predicted by the prediction model, including how and when assessed.	Page 7, Line 206; Page 8, Line 240	Methods, Paragraph 7
	6b	D;V	Report any actions to blind assessment of the outcome to be predicted.	Page 7, Line 196–206	Methods, Paragraph 7
Predictors	7a	D;V	Clearly define all predictors used in developing or validating the multivariable prediction model, including how and when they were measured.	Page 5, Line 139–172	Methods, Paragraph 4
	7b	D;V	Report any actions to blind assessment of predictors for the outcome and other predictors.	Page 7, Line 196–206	Methods, Paragraph 7
Sample size	8	D;V	Explain how the study size was arrived at.	Page 5, Line 139–172	Methods, Paragraph 4

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.	NA	NA
Statistical analysis methods	10a	D	Describe how predictors were handled in the analyses.	NA	NA
	10b	D	Specify type of model, all model-building procedures (including any predictor selection), and method for internal validation.	Page 6, Line 174–194; Page 7, Line 208–240	Methods, Paragraph 8
	10c	V	For validation, describe how the predictions were calculated.	Page 8, Line 242–249	Methods, Paragraph 13
	10d	D;V	Specify all measures used to assess model performance and, if relevant, to compare multiple models.	NA	NA
	10e	V	Describe any model updating (e.g., recalibration) arising from the validation, if done.	NA	NA
Risk groups	11	D;V	Provide details on how risk groups were created, if done.	NA	NA
Development vs. validation	12	V	For validation, identify any differences from the development data in setting, eligibility criteria, outcome, and predictors.	Page 7, Line 220–240	Methods, Paragraph 12
<b>Results</b>					
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.	NA	NA
	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.	Page 5, Line 139–172	Methods, Paragraph 4
	13c	V	For validation, show a comparison with the development data of the distribution of important variables (demographics, predictors and outcome).	NA	NA
Model development	14a	D	Specify the number of participants and outcome events in each analysis.	Page 8, Line 252–305	Results, Paragraph 14
	14b	D	If done, report the unadjusted association between each candidate predictor and outcome.	NA	NA
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).	NA	NA
	15b	D	Explain how to use the prediction model.	Page 8, Line 252–305	Results, Paragraph 14
Model performance	16	D;V	Report performance measures (with CIs) for the prediction model.	Page 8, Line 252–265	Results, Paragraph 14
Model-updating	17	V	If done, report the results from any model updating (i.e., model specification, model performance).	NA	NA
<b>Discussion</b>					
Limitations	18	D;V	Discuss any limitations of the study (such as nonrepresentative sample, few events per predictor, missing data).	Page 12, Line 363–381	Discussion, Paragraph 24

Interpretation	19a	V	For validation, discuss the results with reference to performance in the development data, and any other validation data.	Page 11, Line 356–361	Discussion, Paragraph 23
	19b	D;V	Give an overall interpretation of the results, considering objectives, limitations, and results from similar studies, and other relevant evidence.	Page 12, Line 383–390	Discussion, Paragraph 25
Implications	20	D;V	Discuss the potential clinical use of the model and implications for future research.	Page 10, Line 324–361	Discussion, Paragraph 19
<b>Other information</b>					
Supplementary information	21	D;V	Provide information about the availability of supplementary resources, such as study protocol, Web calculator, and data sets.	Page 13, Line 418–422	Data availability statement
Funding	22	D;V	Give the source of funding and the role of the funders for the present study.	Page 13, Line 395–401	Funding

\* 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.

Article information: <https://dx.doi.org/10.21037/jtd-23-470>

\*As the checklist was provided upon initial submission, the page number/line number reported may be changed due to copyediting and may not be referable in the published version. In this case, the section/paragraph may be used as an alternative reference.