TRIPOD Checklist: Prediction Model Development and Validation

Section	Item		Checklist description	Reported on Page Number/Line Number	Reported on Section/Paragraph
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.	Page1/Line3	Title
Abstract	2	D;V	Provide a summary of objectives, study design, setting, participants, sample size, predictors, outcome, statistical analysis, results, and conclusions.	Page1/Line32-Page2/Line1-24	Abstract
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.	Page3/Line6-12	Introduction/Paragraph 1
	3b	D;V	Specify the objectives, including whether the study describes the development or validation of the model or both.	Page3/Line34-Page4/Line6	Introduction/Paragraph 3
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, ifapplicable.	Page4/Line21-30；Page5/Line34-Page6/Line3	ragraph1; Methods/Cohort selection/Paragraph4
	4b	D;V	Specify the key study dates, including start of accrual; end of accrual; and, if applicable, end of follow-up.	Page4/Line24-26	Methods/Data source/Paragraph1
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.	Page4/Line34-Page5/Line3	Methods/Cohort selection/Paragraph1
	5b	D;V	Describe eligibility criteria for participants.	Page5/Line6-21	Methods/Cohort selection/Paragraph2
	5c	D;V	Give details of treatments received, if relevant.	Page5/Line29-33	Methods/Cohort selection/Paragraph3
Outcome	6a	D;V	Clearly define the outcome that is predicted by the prediction model, including how and when assessed.	Page6/Line15-17	Methods/Statistical analysis/Paragraph1
	6b	D;V	Report any actions to blind assessment of the outcome to be predicted.	Page6/Line15-17	Methods/Statistical analysis/Paragraph1
Predictors	7a	D;V	Clearly define all predictors used in developing or validating the multivariable prediction model, including how and when they were measured.	Page5/Line22-33	Methods/Cohort selection/Paragraph3
	7b	D;V	Report any actions to blind assessment of predictors for the outcome and other predictors.	Page5/Line22-33	Methods/Cohort selection/Paragraph3
Sample size	8	D;V	Explain how the study size was arrived at.	Page4/Line24-25;Page5/Line18-20	Methods/Cohort selection/Paragraph2

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.	Page5/Line6-18	Methods/Cohort selection/Paragraph2
Statistical analysis methods	10a	D	Describe how predictors were handled in the analyses.	Page6/Line18-22	Methods/Statistical analysis/Paragraph2
	10b	D	Specify type of model, all model-building procedures (including any predictor selection), and method for internal validation.	Page6/Line18-Page7/Line14	Methods/Statistical analysis
	10c	V	For validation, describe how the predictions were calculated.	Page9/Line3-9;Page9/Line16-18;	validation;External model validation
	10d	D;V	Specify all measures used to assess model performance and, if relevant, to compare multiple models.	Supplemental Table1	Supplemental Table1
	10e	V	Describe any model updating (e.g., recalibration) arising from the validation, if done.	NA	inapplicability
Risk groups	11	D;V	Provide details on how risk groups were created, if done.	NA	inapplicability
Development vs. validation	12	V	For validation, identify any differences from the development data in setting, eligibility criteria, outcome, and predictors.	Table1	Table1
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.	Figure1	Figure1
	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.	Table1	Table1
	13c	V	For validation, show a comparison with the development data of the distribution of important variables (demographics, predictors and outcome).	Table1	Table1
Model development	14a	D	Specify the number of participants and outcome events in each analysis.	Page7/Line21-Page8/Line2	Results/Patient characteristics
	14b	D	If done, report the unadjusted association between each candidate predictor and outcome.	NA	inapplicability
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).	Page7/Line10;Supplemental method 1	Methods/Statistical analysis;Supplemental method 1
	15b	D	Explain how to the use the prediction model.	Page9/Line22-Page10/Line21	Results/Model application
Model performance	16	D;V	Report performance measures (with CIs) for the prediction model.	Page9/Line3-9;Page9/Line16-18	Results/Internal model validation;Results/External model validatio
Model-updating	17	V	If done, report the results from any model updating (i.e., model specification, model performance).	Page9/Line3-9;Page9/Line16-18	ternal model validatio n
Discussion					
Limitations	18	D;V	Discuss any limitations of the study (such as nonrepresentative sample, few events per predictor, missing data).	Page12/Line27-Page13/Line6	Discussion/Paragraph6

Interpretation	19a	V	For validation, discuss the results with reference to performance in the development data, and any other validation data.	Page12/Line5-12	Discussion/Paragraph4
	19b	D;V	Give an overall interpretation of the results, considering objectives, limitations, and results from similar studies, and other relevant evidence.	Page11/Line5-18;Page11/Line19-34;Page12/Line10-17	Discussion/Paragraph2; Discussion/Paragraph3; Discussion/Paragraph4
Implications	20	D;V	Discuss the potential clinical use of the model and implications for future research.	Page12/Line18-26	Discussion/Paragraph5
Other information					
Supplementary information	21	D;V	Provide information about the availability of supplementary resources, such as study protocol, Web calculator, and data sets.	Supplemental method 1; Supplemental method 2	Supplemental methods
Funding	22	D;V	Give the source of funding and the role of the funders for the present study.	Page13/Line20-26	Acknowledgments/Paragraph1

* 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.

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*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.