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/Line3-4	Title
Abstract	2	D;V	Provide a summary of objectives, study design, setting, participants, sample size, predictors, outcome, statistical analysis, results, and conclusions.	Page2/Line 35-67	Abstract/Paragraph1-4
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.	Page4/Line99-105	Introduction/Paragraph3
	3b	D;V	Specify the objectives, including whether the study describes the development or validation of the model or both.	Page4/Line106-115	Introduction/Paragraph4
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/Line120-Page5Line126	Methods/Paragraph1
	4b	D;V	Specify the key study dates, including start of accrual; end of accrual; and, if applicable, end of follow-up.	Page8/Line233-236	Methods/Paragraph13
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/Line121-123	Methods/Paragraph1
	5b	D;V	Describe eligibility criteria for participants.	Page8/Line231-236	Methods/Paragraph13
	5c	D;V	Give details of treatments received, if relevant.	N/A Not relevant	
Outcome	6a	D;V	Clearly define the outcome that is predicted by the prediction model, including how and when assessed.	Page5/Line142-146	Methods/Paragraph3
	6b	D;V	Report any actions to blind assessment of the outcome to be predicted.	Page5/Line150-Page6/Line158	Methods/Paragraph4
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/Line135-141	Methods/Paragraph2
	7b	D;V	Report any actions to blind assessment of predictors for the outcome and other predictors.	Page5/Line150-152	Methods/Paragraph4
Sample size	8	D;V	Explain how the study size was arrived at.	Page4/Line122	Methods/Paragraph1

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.	Page4/Line120-123	Methods/Paragraph1
Statistical analysis methods	10a	D	Describe how predictors were handled in the analyses.	Page5/Line130-137	Methods/Paragraph2
	10b	D	Specify type of model, all model-building procedures (including any predictor selection), and method for internal validation.	Page5/Line130-146	Methods/Paragraph2-3
	10c	V	For validation, describe how the predictions were calculated.	Page5/Line137-141	Methods/Paragraph2
	10d	D;V	Specify all measures used to assess model performance and, if relevant, to compare multiple models.	Page5/Line155-157	Methods/Paragraph4
	10e	V	Describe any model updating (e.g., recalibration) arising from the validation, if done.	N/A No updating	
Risk groups	11	D;V	Provide details on how risk groups were created, if done.	Page5/Line140-141	Methods/Paragraph1
Development vs. validation	12	V	For validation, identify any differences from the development data in setting, eligibility criteria, outcome, and predictors.	Page4/Line123-Page5/Line124	Methods/Paragraph1
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.	Table 1, supplemental Table1	Table 1, supplemental Table1
	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.	Table 1, supplemental Table1	Table 1, supplemental Table1
	13c	V	For validation, show a comparison with the development data of the distribution of important variables (demographics, predictors and outcome).	Table 1, supplemental Table1	Table 1, supplemental Table1
Model development	14a	D	Specify the number of participants and outcome events in each analysis.	Table 1	Table 1
	14b	D	If done, report the unadjusted association between each candidate predictor and outcome.	Page9/Line278-280	Results/Paragraph1
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).	Page9/Line272-275	Results/Paragraph1
	15b	D	Explain how to the use the prediction model.	Page9/Line281-287	Results/Paragraph2
Model performance	16	D;V	Report performance measures (with CIs) for the prediction model.	Page9/Line281-287	Results/Paragraph2
Model-updating	17	V	If done, report the results from any model updating (i.e., model specification, model performance).	N/A No updating	
Discussion					
Limitations	18	D;V	Discuss any limitations of the study (such as nonrepresentative sample, few events per predictor, missing data).	Page15/Line465-470	Discussion/Paragraph 6

Interpretation	19a	V	For validation, discuss the results with reference to performance in the development data, and any other validation data.	Page13/Line429-Page14/Line452	Discussion/Paragraph4
	19b	D;V	Give an overall interpretation of the results, considering objectives, limitations, and results from similar studies, and other relevant evidence.	Page12Line398-419	Discussion/Paragraph2
Implications	20	D;V	Discuss the potential clinical use of the model and implications for future research.	Page14Line474-478	Conclusion/Paragraph1
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 data	Supplemental data
Funding	22	D;V	Give the source of funding and the role of the funders for the present study.	N/A No 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.