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.	Page 1, Line 3–5	Title
Abstract	2	D;V	Provide a summary of objectives, study design, setting, participants, sample size, predictors, outcome, statistical analysis, results, and conclusions.	Page 1–2, Line 26–61	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.	Page 3, Line 70–82	Introduction,Paragraph 1,2
	3b	D;V	Specify the objectives, including whether the study describes the development or validation of the model or both.	Page 2, Line 83–87	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.	Page 3, Line 94–102	Methods, Paragraph 1
	4b	D;V	Specify the key study dates, including start of accrual; end of accrual; and, if applicable, end of follow-up.	Page 3, 4, Line 98–101	Methods, Paragraph 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.	Page 3, 4, Line 102–106	Methods, Paragraph 1
	5b	D;V	Describe eligibility criteria for participants.	Page 4, Line 98–107	Methods, Paragraph 1
	5c	D;V	Give details of treatments received, if relevant.	Page 4, Line 110–122	Methods, Paragraph 2
Outcome	6a	D;V	Clearly define the outcome that is predicted by the prediction model, including how and when assessed.	Page 4, Line 125–130	Methods, Paragraph 3
	6b	D;V	Report any actions to blind assessment of the outcome to be predicted.	NA, Not needed	NA, Not needed
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 4, Line 102–106	Methods, Paragraph 1
	7b	D;V	Report any actions to blind assessment of predictors for the outcome and other predictors.	NA, Not needed	NA, Not needed
Sample size	8	D;V	Explain how the study size was arrived at.	Retrospective Study	Retrospective Study

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, No missing data	NA, No missing data
Statistical analysis methods	10a	D	Describe how predictors were handled in the analyses.	Page 5, Line 133–148	Methods, Paragraph 4
	10b	D	Specify type of model, all model-building procedures (including any predictor selection), and method for internal validation.	Page 5, Line 133–143	Methods, Paragraph 4
	10c	V	For validation, describe how the predictions were calculated.	Page 5, Line 144–148	Methods, Paragraph 4
	10d	D;V	Specify all measures used to assess model performance and, if relevant, to compare multiple models.	Page 5, Line 142–148	Methods, Paragraph 4
	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.	NA, Divided cohorts study	NA, Divided cohorts study
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.	Page 5, Line 152–155	Results, Paragraph 1
	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, 6, Line 155–170	Results, Paragraph 1
	13c	V	For validation, show a comparison with the development data of the distribution of important variables (demographics, predictors and outcome).	Page 6, 7. Line 186–201	Results, Paragraph 3,4
Model development	14a	D	Specify the number of participants and outcome events in each analysis.	Page 5, 6, Line 164–170	Results, Paragraph 1
	14b	D	If done, report the unadjusted association between each candidate predictor and outcome.	Page 6, Line 167–170	Results, Paragraph 1
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).	Page 6, Line 178–182	Results, Paragraph 2
	15b	D	Explain how to the use the prediction model.	Page 6, Line 181–183	Results, Paragraph 2
Model performance	16	D;V	Report performance measures (with CIs) for the prediction model.	Page 6, 7, Line 186–201	Results, Paragraph 3,4
Model-updating	17	V	If done, report the results from any model updating (i.e., model specification, model performance).	NA	NA
Discussion					
Limitations	18	D;V	Discuss any limitations of the study (such as nonrepresentative sample, few events per predictor, missing data).	Page 8, Line 255–262	Discussion, Paragraph 5

Interpretation	19a	V	For validation, discuss the results with reference to performance in the development data, and any other validation data.	Page 7–8, Line 204–254	Discussion, Paragraph 1-4
	19b	D;V	Give an overall interpretation of the results, considering objectives, limitations, and results from similar studies, and other relevant evidence.	Page 8, 9, Line 263–270	Discussion, Paragraph 6
Implications	20	D;V	Discuss the potential clinical use of the model and implications for future research.	Page 9, Line 270–272	Discussion, Paragraph 6
Other information					
Supplementary information	21	D;V	Provide information about the availability of supplementary resources, such as study protocol, Web calculator, and data sets.	NA	NA
Funding	22	D;V	Give the source of funding and the role of the funders for the present study.	Page 9, Line 275–276	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.

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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.