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/line2-3	title
Abstract	2	D;V	Provide a summary of objectives, study design, setting, participants, sample size, predictors, outcome, statistical analysis, results, and conclusions.	page2/line36-59	abstract/paragraph1
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.	page2-4/line64-110	introduction/paragraph1-3
	3b	D;V	Specify the objectives, including whether the study describes the development or validation of the model or both.	page4/line111-116	introduction/paragraph3
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/line119-126	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.	page4/line119-126	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.	NA	NA no relevant research involved
	5b	D;V	Describe eligibility criteria for participants.	page4/line120-126	methods/paragraph 1
	5c	D;V	Give details of treatments received, if relevant.	NA	NA not relevant
Outcome	6a	D;V	Clearly define the outcome that is predicted by the prediction model, including how and when assessed.	page6-7/line161-211	methods/paragraph 8-9
	6b	D;V	Report any actions to blind assessment of the outcome to be predicted.	NA	NA not relevant
Predictors	7a	D;V	Clearly define all predictors used in developing or validating the multivariable prediction model, including how and when they were measured.	page6-7/line191-211	methods/paragraph 8-9
	7b	D;V	Report any actions to blind assessment of predictors for the outcome and other predictors.	NA	NA not relevant
Sample size	8	D;V	Explain how the study size was arrived at.	page6-7/line191-211	methods/paragraph 8-9

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 not relevant
Statistical analysis methods	10a	D	Describe how predictors were handled in the analyses.	page7/line227-232	methods/paragraph 11
	10b	D	Specify type of model, all model-building procedures (including any predictor selection), and method for internal validation.	page7/line227-232	methods/paragraph 11
	10c	V	For validation, describe how the predictions were calculated.	page7/line227-232	methods/paragraph 11
	10d	D;V	Specify all measures used to assess model performance and, if relevant, to compare multiple models.	page7/line227-232	methods/paragraph 11
	10e	V	Describe any model updating (e.g., recalibration) arising from the validation, if done.	page7/line227-232	methods/paragraph 11
Risk groups	11	D;V	Provide details on how risk groups were created, if done.	page7/line227-232	methods/paragraph 11
Development vs. validation	12	V	For validation, identify any differences from the development data in setting, eligibility criteria, outcome, and predictors.	page7/line227-232	methods/paragraph 11
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.	NA	NA introduction section Figure 1 is a diagram
	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.	page7-8/line232-241	results/paragraph 1
	13c	V	For validation, show a comparison with the development data of the distribution of important variables (demographics, predictors and outcome).	page7-8/line232-241	results/paragraph 1
Model development	14a	D	Specify the number of participants and outcome events in each analysis.	page7-8/line232-241	results/paragraph 1
	14b	D	If done, report the unadjusted association between each candidate predictor and outcome.	page8-10/line267-322	results/paragraph 4-7
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).	page7-10/line232-347	results/pragraph 1-9
	15b	D	Explain how to the use the prediction model.	page7-10/line232-347	results/pragraph 1-9
Model performance	16	D;V	Report performance measures (with CIs) for the prediction model.	page7-10/line232-347	results/pragraph 1-9
Model-updating	17	V	If done, report the results from any model updating (i.e., model specification, model performance).	NA	NA not relevant
Discussion					
Limitations	18	D;V	Discuss any limitations of the study (such as nonrepresentative sample, few events per predictor, missing data).	page11-13/line350-421	discussion/paragraph 1-7

Interpretation	19a	V	For validation, discuss the results with reference to performance in the development data, and any other validation data.	page11-13/line350-421	discussion/paragraph 1-7
	19b	D;V	Give an overall interpretation of the results, considering objectives, limitations, and results from similar studies, and other relevant evidence.	page11-13/line350-421	discussion/paragraph 1-7
Implications	20	D;V	Discuss the potential clinical use of the model and implications for future research.	page11-13/line350-421	discussion/paragraph 1-7
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 not relevant, we have Figure S1, S2, S3 in the MS
Funding	22	D;V	Give the source of funding and the role of the funders for the present study.	page13/line424-431	Acknowledge

* 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/tcr-22-1723
*As the checklist was provided upon initial submission, the page number/line number reported may be changed due to copy editing and may not be referable in the published version. In this case, the section/paragraph may be used as an alternative reference.