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 1-3	N/A
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 23-52	N/A
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 56-72	Introduction section/Paragrah 1
	3b	D;V	Specify the objectives, including whether the study describes the development or validation of the model or both.	Page 4/Line 79-86	Introduction section/Paragrah 2
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 5/Line 89-107	Methods section/Paragraph of "Data sets and Processing"
	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 89-107	Methods
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 89-107	Methods section/Paragraph of "Data sets and Processing"
	5b	D;V	Describe eligibility criteria for participants.	Page 5/Line 89-107	Methods
	5c	D;V	Give details of treatments received, if relevant.	Page 5/Line 89-107	Methods
Outcome	6a	D;V	Clearly define the outcome that is predicted by the prediction model, including how and when assessed.	Page 6-7/Line 122-140	Methods section/Paragraph of " Identification of
	6b	D;V	Report any actions to blind assessment of the outcome to be predicted.	Page 6-7/Line 122-140	Methods
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 5-6/Line 109-114 and Page 6-7/Line 122-140	Methods section/Paragraph of " Identification and Analysis
	7b	D;V	Report any actions to blind assessment of predictors for the outcome and other predictors.	Page 5-6/Line 109-114	Methods
Sample size	8	D;V	Explain how the study size was arrived at.	Page 5/Line 89-107	Methods

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.	Page 5/Line 89-107	Methods section/Paragraph of "Data sets and Processing"
Statistical analysis methods	10a	D	Describe how predictors were handled in the analyses.	Page 6-7/Line 122-140	Methods
	10b	D	Specify type of model, all model-building procedures (including any predictor selection), and method for internal validation.	Page 6-7/Line 122-140	Methods section/Paragraph of " Identification of
	10c	V	For validation, describe how the predictions were calculated.	Page 6-7/Line 122-140	Methods
	10d	D;V	Specify all measures used to assess model performance and, if relevant, to compare multiple models.	Page 7/Line 142-149 and	Methods
	10e	V	Describe any model updating (e.g., recalibration) arising from the validation, if done.	N/A	N/A
Risk groups	11	D;V	Provide details on how risk groups were created, if done.	Page 6-7/Line 129-137	Methods
Development vs. validation	12	V	For validation, identify any differences from the development data in setting, eligibility criteria, outcome, and predictors.	Page 6-7/Line 122-140	Methods section/Paragraph of " Identification of
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.	See supplementary materials for details	See supplementary materials for details
	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.	See supplementary materials for details	See supplementary materials for details
	13c	V	For validation, show a comparison with the development data of the distribution of important variables (demographics, predictors and outcome).	N/A	N/A
Model development	14a	D	Specify the number of participants and outcome events in each analysis.	Page 5/Line 89-107 and	Results and Methods
	14b	D	If done, report the unadjusted association between each candidate predictor and outcome.	Page 12-13/Line 259-266	Results section/Paragraph
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 9-11/Line 192-231	Results section/Paragraph of "Construction of the Radioresponse-related
	15b	D	Explain how to the use the prediction model.	Page 9-11/Line 192-231	Results section/Paragraph
Model performance	16	D;V	Report performance measures (with CIs) for the prediction model.	Page 9-12/Line 192-256	Results section/Paragraph of 2.3, 2.4, 2.5 and 2.6
Model-updating	17	V	If done, report the results from any model updating (i.e., model specification, model performance).	N/A	N/A
Discussion					
Limitations	18	D;V	Discuss any limitations of the study (such as nonrepresentative sample, few events per predictor, missing data).	Page 17-18/Line 368-375	Discussion section/paragraph 5

Interpretation	19a	V	For validation, discuss the results with reference to performance in the development data, and any other validation data.	N/A	N/A
	19b	D;V	Give an overall interpretation of the results, considering objectives, limitations, and results from similar studies, and other relevant evidence.	Page 14-16/Line 304-350	Discussion section/paragraph 2 and 3
Implications	20	D;V	Discuss the potential clinical use of the model and implications for future research.	Page 14/Line 301-303 and [illegible]	Discussion [illegible]
Other information					
Supplementary information	21	D;V	Provide information about the availability of supplementary resources, such as study protocol, Web calculator, and data sets.	Page 18/Line 384-386	Data Availability section
Funding	22	D;V	Give the source of funding and the role of the funders for the present study.	Page 18-19/Line 394-398	Acknowledgments section

* 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.