

Section/Topic	Item	Development / evaluation ¹	Checklist item	Reported on page
TITLE				
<i>Title</i>	1	D;E	Identify the study as developing or evaluating the performance of a multivariable prediction model, the target population, and the outcome to be predicted	p.1, L1–3
ABSTRACT				
<i>Abstract</i>	2	D;E	See TRIPOD+AI for Abstracts checklist	pp.3–4, L38–81
INTRODUCTION				
<i>Background</i>	3a	D;E	Explain the healthcare context (including whether diagnostic or prognostic) and rationale for developing or evaluating the prediction model, including references to existing models	pp.5–6, L84–107
	3b	D;E	Describe the target population and the intended purpose of the prediction model in the context of the care pathway, including its intended users (e.g., healthcare professionals, patients, public)	p.6, L108–119; p.7, L138–146
	3c	D;E	Describe any known health inequalities between sociodemographic groups	p.7, L144–146; p.25, L576–583
<i>Objectives</i>	4	D;E	Specify the study objectives, including whether the study describes the development or validation of a prediction model (or both)	p.6, L108–119
METHODS				
<i>Data</i>	5a	D;E	Describe the sources of data separately for the development and evaluation datasets (e.g., randomised trial, cohort, routine care or registry data), the rationale for using these data, and representativeness of the data	p.6, L122–123 p.7, L138–154
	5b	D;E	Specify the dates of the collected participant data, including start and end of participant accrual; and, if applicable, end of follow-up	p.7, L139–140
<i>Participants</i>	6a	D;E	Specify key elements of the study setting (e.g., primary care, secondary care, general population) including the number and location of centres	p.6, L122–123 p.7, L144–146
	6b	D;E	Describe the eligibility criteria for study participants	p.7, L138–143
	6c	D;E	Give details of any treatments received, and how they were handled during model development or evaluation, if relevant	p.9, L181–190
<i>Data preparation</i>	7	D;E	Describe any data pre-processing and quality checking, including whether this was similar across relevant sociodemographic groups	p.9, L200–202 p.13, L280–288
<i>Outcome</i>	8a	D;E	Clearly define the outcome that is being predicted and the time horizon, including how and when assessed, the rationale for choosing this outcome, and whether the method of outcome assessment is consistent across sociodemographic groups	p.8, L173–180 p.9, L191–198
	8b	D;E	If outcome assessment requires subjective interpretation, describe the qualifications and demographic characteristics of the outcome assessors	p.8, L156–157 p.43, L864–866
	8c	D;E	Report any actions to blind assessment of the outcome to be predicted	p.8, L175–180
<i>Predictors</i>	9a	D	Describe the choice of initial predictors (e.g., literature, previous models, all available predictors) and any pre-selection of predictors before model building	p.8, L165–172 p.11, L231–245
	9b	D;E	Clearly define all predictors, including how and when they were measured (and any actions to blind assessment of predictors for the outcome and other predictors)	p.8, L156–172
	9c	D;E	If predictor measurement requires subjective interpretation, describe the qualifications and demographic characteristics of the predictor assessors	p.8, L156–157, L171–172
<i>Sample size</i>	10	D;E	Explain how the study size was arrived at (separately for development and evaluation), and justify that the study size was sufficient to answer the research question. Include details of any sample size calculation	pp.13–14, L289–309
<i>Missing data</i>	11	D;E	Describe how missing data were handled. Provide reasons for omitting any data	pp.12–13, L271–279
<i>Analytical methods</i>	12a	D	Describe how the data were used (e.g., for development and evaluation of model performance) in the analysis, including whether the data were partitioned, considering any sample size requirements	pp.10–11, L221–229 p.15, L340–346
	12b	D	Depending on the type of model, describe how predictors were handled in the analyses (functional form, rescaling, transformation, or any standardisation).	p.9, L200–202
	12c	D	Specify the type of model, rationale ² , all model-building steps, including any hyperparameter tuning, and method for internal validation	pp.9–11, L199–229
	12d	D;E	Describe if and how any heterogeneity in estimates of model parameter values and model performance was handled and quantified across clusters (e.g., hospitals, countries). See TRIPOD-Cluster for additional considerations ³	N/A – single centre
	12e	D;E	Specify all measures and plots used (and their rationale) to evaluate model performance (e.g., discrimination, calibration, clinical utility) and, if relevant, to compare multiple models	pp.14–16, L316–350
	12f	E	Describe any model updating (e.g., recalibration) arising from the model evaluation, either overall or for particular sociodemographic groups or settings	N/A – no updating
	12g	E	For model evaluation, describe how the model predictions were calculated (e.g., formula, code, object, application programming interface)	p.10, L216–220; p.28, L638–641
<i>Class imbalance</i>	13	D;E	If class imbalance methods were used, state why and how this was done, and any subsequent methods to recalibrate the model or the model predictions	pp.10–11, L224–229
<i>Fairness</i>	14	D;E	Describe any approaches that were used to address model fairness and their rationale	p.25, L578–583
<i>Model output</i>	15	D	Specify the output of the prediction model (e.g., probabilities, classification). Provide details and rationale for any classification and how the thresholds were identified	p.10, L212–216 p.15, L326–328

¹ D=items relevant only to the development of a prediction model; E=items relating solely to the evaluation of a prediction model; D;E=items applicable to both the development and evaluation of a prediction model

² Separately for all model building approaches.

³ TRIPOD-Cluster is a checklist of reporting recommendations for studies developing or validating models that explicitly account for clustering or explore heterogeneity in model performance (eg, at different hospitals or centres). Debray et al, BMJ 2023; 380: e071018 [DOI: 10.1136/bmj-2022-071018]

<i>Training versus evaluation</i>	16	D;E	Identify any differences between the development and evaluation data in healthcare setting, eligibility criteria, outcome, and predictors	pp.10–11, L221–229; p.15, L340–346
<i>Ethical approval</i>	17	D;E	Name the institutional research board or ethics committee that approved the study and describe the participant-informed consent or the ethics committee waiver of informed consent	p.6, L123–129; p.27, L616–623
OPEN SCIENCE				
<i>Funding</i>	18a	D;E	Give the source of funding and the role of the funders for the present study	p.28, L649–651
<i>Conflicts of interest</i>	18b	D;E	Declare any conflicts of interest and financial disclosures for all authors	p.28, L647–648
<i>Protocol</i>	18c	D;E	Indicate where the study protocol can be accessed or state that a protocol was not prepared	p.6, L129–131
<i>Registration</i>	18d	D;E	Provide registration information for the study, including register name and registration number, or state that the study was not registered	p.4, L79; p.6, L126–127
<i>Data sharing</i>	18e	D;E	Provide details of the availability of the study data	pp.27–28, L630–637, L62–646
<i>Code sharing</i>	18f	D;E	Provide details of the availability of the analytical code ⁴	p.28, L638–641
PATIENT & PUBLIC INVOLVEMENT				
<i>Patient & Public Involvement</i>	19	D;E	Provide details of any patient and public involvement during the design, conduct, reporting, interpretation, or dissemination of the study or state no involvement.	N/A – no PPI
RESULTS				
<i>Participants</i>	20a	D;E	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.	p.16, L353–360; p.41, L847–853
	20b	D;E	Report the characteristics overall and, where applicable, for each data source or setting, including the key dates, key predictors (including demographics), treatments received, sample size, number of outcome events, follow-up time, and amount of missing data. A table may be helpful. Report any differences across key demographic groups.	p.7, L139–140; p.16, L353–369; p.35, L794–796
	20c	E	For model evaluation, show a comparison with the development data of the distribution of important predictors (demographics, predictors, and outcome).	N/A – no external evaluation dataset
<i>Model development</i>	21	D;E	Specify the number of participants and outcome events in each analysis (e.g., for model development, hyperparameter tuning, model evaluation)	pp.10–11, L226–229; p.16, L355–360; pp.39–40, L820–843
<i>Model specification</i>	22	D	Provide details of the full prediction model (e.g., formula, code, object, application programming interface) to allow predictions in new individuals and to enable third-party evaluation and implementation, including any restrictions to access or re-use (e.g., freely available, proprietary) ⁵	pp.9–10, L199–220; p.28, L638–641; p.44, L875–883
<i>Model performance</i>	23a	D;E	Report model performance estimates with confidence intervals, including for any key subgroups (e.g., sociodemographic). Consider plots to aid presentation.	p.17, L370–382; pp.18–19, L409–440; pp.36–40, L799–843
	23b	D;E	If examined, report results of any heterogeneity in model performance across clusters. See TRIPOD Cluster for additional details ³ .	N/A – single centre
<i>Model updating</i>	24	E	Report the results from any model updating, including the updated model and subsequent performance	N/A – no updating
DISCUSSION				
<i>Interpretation</i>	25	D;E	Give an overall interpretation of the main results, including issues of fairness in the context of the objectives and previous studies	pp.20–25, L453–567; p.25, L578–583
<i>Limitations</i>	26	D;E	Discuss any limitations of the study (such as a non-representative sample, sample size, overfitting, missing data) and their effects on any biases, statistical uncertainty, and generalizability	pp.25–26, L573–598
<i>Usability of the model in the context of current care</i>	27a	D	Describe how poor quality or unavailable input data (e.g., predictor values) should be assessed and handled when implementing the prediction model	p.8, L171–172; pp.12–13, L272–279
	27b	D	Specify whether users will be required to interact in the handling of the input data or use of the model, and what level of expertise is required of users	p.8, L165–172; pp.26–27, L606–614
	27c	D;E	Discuss any next steps for future research, with a specific view to applicability and generalizability of the model	p.25, L582–583; pp.26–27, L606–614

From: Collins GS, Moons KGM, Dhiman P, et al. *BMJ* 2024;385:e078378. doi:10.1136/bmj-2023-078378

⁴ This relates to the analysis code, for example, any data cleaning, feature engineering, model building, evaluation.

⁵ This relates to the code to implement the model to get estimates of risk for a new individual.