**PROBAST**

Study:

Step 2: Type of prediction study

**Is the study a diagnostic or a prognostic study?**

**Is the study a development only, development and validation or validation only study?**

**What is the model of interest?**

**What is the outcome of interest?**

Step 3: Assess risk of bias

**Domain 1: Participants**

**Describe the sources of data and criteria for participant selection**

**1.1 Were appropriate data sources used, e.g. cohort, RCT or nested case-control study data?**

**1.2 Were all inclusions and exclusions of participants appropriate?**

**Risk of bias introduced by selection of participants:**

**Rationale of bias rating**

**Domain 2: Predictors**

**List and describe predictors included in the final model, e.g. definition and timing of assessment**

**2.1 Were predictors defined and assessed in a similar way for all participants?**

**2.2 Were predictor assessments made without knowledge of outcome data?**

**2.3 Are all predictors available at the time the model intended to be used?**

**Risk of bias introduced by predictors or their assessment**

**Rationale of bias rating**

**Domain 3: Outcome**

**Describe the outcome, how it was defined and determined, and the time interval between predictor assessment and outcome determination:**

**3.1 Was the outcome determined appropriately?**

**3.2 Was a pre-specified or standard outcome definition used?**

**3.3 Were predictors excluded from the outcome definition?**

**3.4 Was the outcome defined and determined in a similar way for all participants?**

**3.5 Was the outcome determined without knowledge of predictor information?**

**3.6 Was the time interval between predictor assessment and outcome determination appropriate?**

**Risk of bias introduced by the outcome or its determination**

**Rationale of bias rating**

**Domain 4: Analysis**

**Describe number of participants, number of candidate predictors, outcome events and events per candidate predictor**

**Describe how the model was developed, predictor selection and risk group definition**

**Describe whether and how the model was validated, either internally (cross validation, random split sample) or externally (e.g. temporal validation, geographical validation, different setting, different type of participants)**

**Describe the performance measures of the model, e.g. calibration, discrimination, classification, net benefit, and whether they were adjusted for optimism**

**Describe any participants who were excluded from the analysis**

**Describe missing data on predictors and outcomes as well as methods used for missing data**

**4.1 Were there a reasonable number of participants with the outcome?**

**4.2 Were continuous and categorical predictors handled appropriately?**

**4.3 Were all enrolled participants included in the analysis?**

**4.4 Were participants with missing data handled appropriately?**

**4.5 Was selection of predictors based on univariable analysis avoided?**

**4.6 Were complexities in the data (e.g. censoring, competing risks, sampling of controls)**

**accounted for appropriately?**

**4.7 Were relevant model performance measures evaluated appropriately?**

**4.8 Were model overfitting and optimism in model performance accounted for?**

**4.9 Do predictors and their assigned weights in the final model correspond to the results**

**from multivariable analysis?**

**Risk of bias introduced by the analysis**

**Rationale of bias rating**

**Overall Risk of bias**