

**Supplementary Table 1.** PROBAST results of included studies

Author (year)	RoB				Applicability			Overall	
	1. Participants	2. Predictors	3. Outcome	4. Analysis	1. Participants	2. Predictors	3. Outcome	RoB	Appli- cability
Liang et al. [27] (2019)	+	-	+	+	+	-	+	-	-
Yan et al. [28] (2019)	-	+	+	+	-	+	+	-	-
Li et al. [29] (2019)	+	-	-	-	+	-	-	-	-
Taghavi et al. [15] (2021)	+	-	-	+	+	-	-	-	-
Lee et al. [30] (2020)	?	-	+	?	?	-	+	-	-
Xiao et al. [31] (2022)	?	+	+	+	-	+	+	?	-
Hao et al. [32] (2022)	+	+	+	+	+	+	+	+	+

“+” indicates low RoB/low concern regarding applicability; “-” indicates high RoB/high concern regarding applicability; “?” indicates unclear RoB/unclear concern regarding applicability.

PROBAST, prediction model risk of bias assessment tool; RoB, risk of bias.

**Supplementary Table 2.** Characteristics of the predictive models included in the systematic review, and critical appraisal for risk of bias and applicability

Author (year)	Modeling method	Sample size	Events, n (%)	No predictors		EPV or EPP	Selection of candidate predictors	Selection of final predictors	Number (%) and handling of missing data	Type of validation	Performance measures
				Candidate	Final						
Liang et al. [27] (2019)	Machine learning techniques	108	54 (50.0)	22	22	2.5	All available predictors	LASSO selection	n (%): Unknown Method: No information	Int: Cross-validation Ext: None	Cal: Not evaluated Disc: C-Statistic/AUC graph Ov: Not evaluated
Yan et al. [28] (2019)	Cox regression	32,819	455 (1.4)	11	5	41.4	Based on univariable associations and clinical relevance	Forward selection	n (%): Unknown Method: No information	Int: Bootstrap Ext: None	Cal: Calibration plot/HL test Disc: C-Statistic/AUC graph/Log-rank test/Risk group curves Ov: Not evaluated
Li et al. [29] (2019)	Machine learning techniques	48	24 (50.0)	17	6	1.4	All available predictors	Other	n (%): Unknown Method: No information	Int: Cross-validation Ext: None	Cal: Not evaluated Disc: C-Statistic/AUC graph Ov: Not evaluated
Taghavi et al. [15] (2021)	Machine learning techniques	91	24 (26.4)	1,774	104	0.0	Based on univariable associations	Other	n (%): 7 (7.7) Method: Single imputation	Int: Cross-validation Ext: None	Cal: Not evaluated Disc: C-Statistic Ov: Not evaluated
Lee et al. [30] (2020)	Machine learning techniques	2,019	100 (5.0)	4,096	6	0.0	Based on univariable associations	Unclear	n (%): Unknown Method: No information	Int: Cross-validation Ext: None	Cal: Not evaluated Disc: C-Statistic/Log-rank test/Risk group curves Ov: Not evaluated
Xiao et al. [31] (2022)	Machine learning techniques	611	128 (20.9)	15	4	8.5	Based on univariable associations and clinical relevance	Other	n (%): 0 (0.0) Method: No information	Int: Bootstrap Ext: None	Cal: Calibration plot/HL test Disc: C-Statistic/AUC graph/Log-rank test/Risk group curves Ov: Not evaluated
Hao et al. [32] (2022)	Multilevel logistic regression	293	75 (25.6)	19	7	3.9	Based on univariable associations and clinical relevance	LASSO selection	n (%): 0 (0.0) Method: No information	Int: Bootstrap Ext: None	Cal: Calibration plot/HL test/ Comparison of actual CITL and slope with the ideal values Disc: C-Statistic/AUC graph Ov: Not evaluated

EPV, event per variable; EPP, per parameter; LASSO, least absolute shrinkage and selection operator; Int, internal; Ext, external; Cal, calibration; Disc, discrimination; AUC, area under the receiver operating characteristic curve; Ov, overall measures; HL, Hosmer-Lemeshow test; CITL, Calibration-in-the-large.