

Number	Author, Year	Outcome	Modelling method	Sample size	Events n (%)	No. predictors Cand.	Final	EPV or EPP	Selection of candidate predictors	Selection of final predictors	Handling of missing data	Type of validation	Performance measures	C-statistics	Presentation
1	Ying P. Tabak, 2009	Mortality	Machine learning techniques: RPART	43893	774 (1.8)	33	4	23.45	Based on prior knowledge	No information	Method: No information	Int: Bootstrap Ext: Unclear	Cal: Not evaluated Disc: C-Statistic Ov: Not evaluated	0.72(0.70-0.74)	None
2	Ying P. Tabak, 2013	Mortality	Logistic regression	69299	2240 (3.2)	35	25	64.00	Based on univariable associations	No information	Method: Put missing values in a separate column	Int: None (Apparent performance) Ext: Temporal	Cal: Calibration plot / HL test Disc: C-Statistic Ov: Not evaluated	0.83(0.82-0.84)	Score system
3	Peter K. Lindenauer, 2013	Mortality	Logistic regression	150035	12903 (8.6)	Unkown	42	307.20	Based on prior knowledge	No information	Method: No information	Int: Random split data Ext: None	Disc: C-Statistic Ov: Not evaluated Cal: HL test	0.72	None
4	Cassandra M. Batzloff, 2014	Mortality	Logistic regression	591	295 (49.9)	8	2	36.88	Based on univariable associations	Stepwise selection	Method: No information	Int: Bootstrap Ext: None	Disc: C-Statistic Ov: Not evaluated	0.68(0.686-0.688)	Score system
5	Matthew Bonomo, 2022	Readmission	Machine learning techniques: Random forest	3238	1103 (34.1)	20	5	55.15	Based on prior knowledge	No information	Method: Single imputation	Int: Random split data and cross-validation Ext: None	Cal: Calibration plot / Slope / calibration intercept Disc: C-Statistic / AUC graph Cal: Calibration plot	0.69 (0.66-0.73)	None
6	Shi Chen, 2023	Mortality	Logistic regression	1346	185 (13.7)	22	15	8.41	Based on univariable associations	No information	Method: Complete-case analysis	Int: Random split data Ext: Completely independent	Disc: C-Statistic / AUC graph Ov: Not evaluated Cal: Calibration plot / Slope / HL test	0.785(0.751-0.820)	Nomogram
7	M.J. WILDMAN, 2009	Mortality	Logistic regression	832	517 (62.1)	22	9	14.32	Based on prior knowledge	Backward elimination	Method: Single imputation	Int: Bootstrap Ext: None	Disc: C-Statistic Ov: Not evaluated Cal: Not evaluated	0.747	Score system
8	Alex C. Asimwe, 2011	Mortality	Machine learning techniques: CART	4986	452 (9.1)	29	3	15.59	Based on prior knowledge	No information	Method: No information	Int: Random split data Ext: None	Disc: C-Statistic / AUC graph / sensitivity and specificity Ov: Not evaluated Cal: HL test	0.734(0.723-0.756)	None
9	John Steer, 2012	Mortality	Logistic regression	920	96 (10.4)	54	5	1.78	Based on univariable associations	Backward elimination	Method: Multiple imputation	Int: Bootstrap Ext: None	Disc: C-Statistic / AUC graph Ov: Not evaluated Cal: Calibration plot / HL test	0.86(0.82-0.89)	Score system
10	C Echevarria, 2017	Poor outcome	Logistic regression	824	297 (36.0)	23	5	12.91	Based on prior knowledge	Backward elimination	Method: Multiple imputation	Int: Temporal? Ext: Different setting	Disc: C-Statistic / AUC graph Ov: Not evaluated Cal: Calibration plot / HL test / Studentised residuals and Cook's distance	0.73(0.70-0.77)	Score system
11	Tom Hartley, 2021	Mortality	Logistic regression	489	124 (25.4)	21	6	5.90	Based on univariable associations	Backward elimination	Method: Multiple imputation	Int: None (Apparent performance) Ext: Completely independent	Disc: C-Statistic / AUC graph Ov: Not evaluated Cal: Calibration plot / Slope / HL test	0.79(0.75-0.83)	Score system
12	Prachya Mekanimidee, 2021	Mortality	Logistic regression	923	101 (10.9)	12	7	8.42	Based on univariable associations	Backward elimination	Method: Multiple imputation	Int: Bootstrap Ext: None	Disc: C-Statistic / AUC graph Ov: Not evaluated Cal: HL test	0.82(0.77-0.86)	Sum score and online calculator
13	SUSANA GARCÍA-GUTIÉRREZ, 2014	Poor outcome	Logistic regression	1243	99 (8.0)	18	3	5.50	Based on univariable associations	No information	Method: Complete-case analysis	Int: Random split data and Bootstrap Ext: None	Disc: C-Statistic / AUC graph Ov: Not evaluated Cal: Calibration plot / HL test	0.8(0.8 - 0.9)	Score system
14	José M Quintana, 2014	Mortality	Logistic regression	1242	30 (2.4)	24	5	1.25	Based on univariable associations	No information	Method: Single imputation	Int: Random split data Ext: None	Disc: C-Statistic / sensitivity and specificity Ov: Not evaluated Cal: HL test	continuous:0.85(0.77 - 0.93) categorical:0.84(0.76 - 0.91)	Score system
15	J. M. Quintana, 2014 (1)	ICU/RICU admission	Logistic regression	1078	135 (12.5)	17	3	7.94	Based on univariable associations	No information	Method: Single and multiple imputation	Int: Random split data Ext: None	Disc: C-Statistic / AUC graph Ov: Not evaluated Cal: HL test	continuous: 0.87(0.84-0.90) categorical: 0.84(0.81 - 0.87)	Score system
16	J. M. Quintana, 2014 (2)	IRCU admission	Logistic regression	1078	135 (12.5)	17	2	7.94	Based on univariable associations	No information	Method: Single and multiple imputation	Int: Random split data Ext: None	Disc: C-Statistic / AUC graph Ov: Not evaluated Cal: HL test	0.86(0.83-0.90)	None
17	J. M. Quintana, 2014 (3)	ICU admission	Logistic regression	1078	135 (12.5)	17	2	7.94	Based on univariable associations	No information	Method: Single and multiple imputation	Int: Random split data Ext: None	Disc: C-Statistic / AUC graph Ov: Not evaluated Cal: HL test	0.83(0.75-0.91)	None
18	J. M. Quintana, 2014 (4)	Mortality	Logistic regression	1078	135 (12.5)	17	4	7.94	Based on univariable associations	No information	Method: Single and multiple imputation	Int: Random split data Ext: None	Disc: C-Statistic / AUC graph Ov: Not evaluated Cal: HL test	0.78(0.71-0.85)	None
19	J. M. Quintana, 2014 (5)	Mortality	Logistic regression	1078	135 (12.5)	17	3	7.94	Based on univariable associations	No information	Method: Single and multiple imputation	Int: Random split data Ext: None	Disc: C-Statistic / AUC graph Ov: Not evaluated Cal: HL test	0.74(0.63-0.84)	None
20	J. M. Quintana, 2014 (6)	Mortality	Logistic regression	1078	135 (12.5)	17	3	7.94	Based on univariable associations	No information	Method: Single and multiple imputation	Int: Random split data Ext: None	Disc: C-Statistic / AUC graph Ov: Not evaluated Cal: HL test	0.86(0.77-0.95)	None
21	Pedro Almagro , MD, 2014	Mortality	no information	606	27 (4.5)	5	5	2.70	Based on prior knowledge	No information	Method: No information	Int: None (Apparent performance) Ext: Completely independent	Disc: C-Statistic / AUC graph / K-M Ov: Not evaluated Cal: Not evaluated	0.73	Score system
22	Cristóbal Esteban, 2015	Mortality	Machine learning techniques: CART	1252	134 (10.7)	15	5	8.93	Based on univariable associations	Pre-specified model (not selection)	Method: Put missing values in a separate column	Int: Bootstrap Ext: None	Disc: C-Statistic / AUC graph Ov: Not evaluated Cal: HL test	0.835(0.783-0.888)	None
23	Juan Luis García-Rivero, 2017	Poor outcome	Logistic regression	106	39 (36.8)	13	4	3.00	Based on univariable associations	Backward elimination	Method: No information	Int: None (Apparent performance) Ext: None	Disc: C-Statistic / AUC graph Ov: Not evaluated Cal: Calibration plot / Slope / Intercept	0.75(0.64-0.85)	None
24	Cesar Alameda, 2021	Mortality	Logistic regression	1696	17 (1.0)	30	3	0.57	Based on univariable associations	Stepwise selection	Method: Multiple imputation	Int: Bootstrap Ext: None	Disc: C-Statistic / AUC graph Ov: Not evaluated Cal: Not evaluated	0.811	Score system
25	Ying Wang, 2014	Prolonged length of stay	Logistic regression	599	150	31	6	4.80	Based on univariable associations	Manual stepwise selection	Method: Single imputation	Int: None (Apparent performance) Ext: None	Disc: C-Statistic / AUC graph Ov: Not evaluated Cal: Calibration plot	0.73	None
26	Yukiyo Sakamoto, 2017	Mortality	Logistic regression	3064	209 (6.8)	10	8	20.90	Based on prior knowledge	No information	Method: No information	Int: Bootstrap Ext: None	Disc: C-Statistic Ov: Not evaluated Cal: Calibration plot	0.775	Nomogram
27	Akihiro Shiroshita, 2022	Mortality	Machine learning techniques: XGBoost	1190	88 (7.4)	10	10	8.80	Based on prior knowledge	No information	Method: No processing	Int: Random split data and cross-validation Ext: None	Disc: C-Statistic / AUC graph Ov: Not evaluated Cal: Not evaluated	0.76	None
28	Jiang-Chen Peng, 2022	Mortality	Logistic regression	494	77 (15.6)	32	6	2.41	Based on univariable associations	Backward elimination	Method: Single imputation	Int: Bootstrap Ext: None	Disc: C-Statistic / AUC graph / Risk group curves Cal: Not evaluated	0.745(0.712-0.778)	Nomogram
29	A. Mohan, 2007	Mortality	Logistic regression	151	38 (25.2)	23	2	1.65	Based on univariable associations	Stepwise selection	Method: No information	Int: None (Apparent performance) Ext: None	Disc: C-Statistic / AUC graph / Sensitivity and specificity Ov: Not evaluated Cal: Not evaluated	0.73(0.63 - 0.82)	Sum score
29	A. Mohan, 2007	Mortality	Logistic regression	151	99 (65.6)	23	3	2.26	Based on univariable associations	Stepwise selection	Method: No information	Int: None (Apparent performance) Ext: None	Disc: C-Statistic / AUC graph / Sensitivity and specificity Ov: Not evaluated Cal: HL test	0.73(0.63 - 0.82)	Sum score
31	Karthikeyan Ramaraju, 2016	Prolonged hospital stay	Logistic regression	255	71 (27.8)	17	3	4.18	Based on univariable associations	Stepwise selection	Method: No information	Int: None (Apparent performance) Ext: None	Disc: C-Statistic / AUC graph Ov: Not evaluated Cal: HL test	0.805(0.729-0.881)	Sum score
31	Karthikeyan Ramaraju, 2016	Prolonged hospital stay	Logistic regression	255	41 (16.1)	17	4	2.41	Based on univariable associations	Stepwise selection	Method: No information	Int: None (Apparent performance) Ext: None	Disc: C-Statistic / AUC graph Ov: Not evaluated Cal: Not evaluated	0.805(0.729-0.881)	Sum score
33	Filia Diamante MD, 2014	Prolonged length of stay	Unclear	164	84 (51.2)	21	7	3.81	Based on univariable associations	Other	Method: No information	Int: None (Apparent performance) Ext: Temporal	Disc: C-Statistic Ov: Not evaluated	0.960 (0.917-0.984)	Score system

34	N. Roche, 2008	Mortality	Logistic regression	794	59 (7.4)	17	3	3.47	Based on univariable associations	Backward elimination	Method: No information	Int: Random split data Ext: None	Cal: Not evaluated Disc: C-Statistic Ov: Not evaluated Cal: Not evaluated	0.79	Score system
35	Nicolas Roche, 2014	Mortality	Logistic regression	1824	45 (2.5)	44	4	1.02	Based on univariable associations	Backward elimination	Method: No information	Int: Bootstrap Ext: Different setting	Disc: C-Statistic Ov: Not evaluated Cal: Not evaluated	0.79(0.74-0.82)	Score system
36	Yi Chen, 2020	ICU admission	Logistic regression	171	36 (21.1)	14	2	2.57	Based on univariable associations	No information	Method: Complete-case analysis	Int: None (Apparent performance) Ext: None Int: None (Apparent performance)	Disc: C-Statistic / AUC graph Ov: Not evaluated Cal: Not evaluated	0.92(0.86-0.97)	None
37	Liping Fan, 2014	NPPV failures	Logistic regression	261	55 (21.1)	16	3	3.44	Based on univariable associations	Stepwise selection	Method: No information	Int: None (Apparent performance) Ext: None Int: None (Apparent performance)	Disc: C-Statistic / AUC graph Ov: Not evaluated Cal: Not evaluated	0.86(0.81-0.90)	None
38	Dong Liu, 2015	Re-exacerbation	Logistic regression	176	86 (48.9)	14	10	6.14	Based on univariable associations	No information	Method: No information	Int: None (Apparent performance) Ext: None Int: None (Apparent performance)	Disc: C-Statistic / AUC graph Ov: Not evaluated Cal: Not evaluated	0.75(0.678-0.821)	Score system
39	Qi-fang Shi, 2018	Mortality	no information	112	38 (33.9)	5	5	1.41	Based on univariable associations	Backward elimination	Method: No information	Int: None (Apparent performance) Ext: None Int: None (Apparent performance)	Disc: C-Statistic / AUC graph Ov: Not evaluated Cal: Not evaluated	0.852	Score system
40	Wei-ping Hu, 2019	Re-exacerbation	Logistic regression	686	109 (15.9)	16	8	6.81	Based on prior knowledge	Backward elimination	Method: No information	Int: Bootstrap Ext: None	Cal: Calibration plot Disc: C-Statistic Ov: Not evaluated Cal: Not evaluated	0.702(0.648-0.756)	Nomogram
41	Mi Zhou, 2019	Poor outcome	Machine learning techniques: CART	552	244	7	7	34.90	Based on prior knowledge	No information	Method: Complete-case analysis	Int: Random split data and cross-validation Ext: None	Disc: C-Statistic / AUC graph Ov: Not evaluated Cal: Not evaluated	0.75	None
42	Xing Yu, 2020	Mortality	Logistic regression	695	42 (6.0)	39	6	1.08	Based on univariable associations	No information	Method: No information	Int: Temporal? Ext: Different setting	Disc: C-Statistic / AUC graph Ov: Not evaluated Cal: Not evaluated	0.929	Score system
43	Junfeng Peng, 2020	Severity	Machine learning techniques: C5.0	410	202 (49.3)	28	28	7.21	Based on prior knowledge	Unclear	Method: No information	Int: Random split data and cross-validation Ext: None Int: None (Apparent performance)	Disc: C-Statistic / AUC graph Ov: Not evaluated Cal: Not evaluated	0.803	None
44	Wei Bi, 2020	Mechanical ventilation	Logistic regression	452	158 (35.0)	6	4	26.33	Based on univariable associations	No information	Method: No information	Int: None (Apparent performance) Ext: None	Disc: C-Statistic / AUC graph Ov: Not evaluated Cal: Not evaluated	0.826(0.786-0.866)	Sum score
45	Fen Dong, 2021	Mortality	Logistic regression	1096	29 (2.6)	22	4	1.32	Based on univariable associations	LASSO selection	Method: No information	Int: Bootstrap Ext: Temporal	Cal: Calibration plot / Slope / HL test Disc: C-Statistic / AUC graph Ov: Not evaluated Cal: Not evaluated	0.9147(0.8850-0.9444)	Score system
46	Lan Chen, 2021	Mortality	Logistic regression	601	19 (3.2)	80	8	0.24	Based on prior knowledge	LASSO selection	Method: No information	Int: Bootstrap Ext: None	Disc: C-Statistic / AUC graph Ov: Not evaluated Cal: Not evaluated	0.94(0.895- 0.985)	Nomogram
47	Lili Chen and Shiping Chen, 2021	Readmission	Machine learning techniques: XGBoost	636	187 (29.4)	55	26	3.40	Based on univariable associations	No information	Method: Multiple imputation	Int: Random split data Ext: None	Disc: C-Statistic / AUC graph Ov: Not evaluated Cal: Not evaluated	0.814(0.812-0.815)	None
48	Lifen Yang, 2022	Prolonged length of stay	Logistic regression	225	152 (67.6)	40	11	1.83	Based on univariable associations	Stepwise selection	Method: No information	Int: None (Apparent performance) Ext: None	Cal: Calibration plot / HL test Disc: C-Statistic / AUC graph Ov: Not evaluated Cal: Not evaluated	0.795(0.730-0.861)	None
49	Dawei Chen, 2023	Mortality	Logistic regression	1121	79 (7.0)	35	5	2.26	Based on univariable associations	No information	Method: No information	Int: Bootstrap Ext: Different setting	Disc: C-Statistic / AUC graph Ov: Not evaluated Cal: Not evaluated	0.85(0.81-0.89)	Score system
50	Lin Yu, 2023	Mortality	Machine learning techniques: Random Forest	658	42 (6.4)	10	9	4.20	Based on prior knowledge	Unclear	Method: Multiple imputation	Int: Random split data and Bootstrap Ext: None	Disc: C-Statistic / AUC graph Ov: Not evaluated Cal: Calibration plot	0.80 (0.75-0.84)	None
51	Shiyi He, 2023	Respiratory Failure	Logistic regression	124	48 (38.7)	21	3	2.29	Based on univariable associations	No information	Method: No information	Int: Bootstrap Ext: None	Disc: C-Statistic / AUC graph Ov: Not evaluated Cal: Calibration plot	0.77(0.70-0.86)	Nomogram
52	Li-Na Yan, 2024	Acute heart failure	Logistic regression	330	130 (39.4)	26	9	5.00	Based on univariable associations	No information	Method: No information	Int: None (Apparent performance) Ext: Different setting	Cal: Calibration plot / HL test Disc: C-Statistic / AUC graph Ov: Not evaluated Cal: Not evaluated	0.949(0.91-0.961)	Nomogram
53	Reza Fakhraei, 2023	Readmission	logistic regression	3620	518 (14.3)	82	2	6.32	Based on prior knowledge	Forward selection	Method: Single imputation	Int: Cross-validation Ext: None	Disc: C-Statistic Ov: Not evaluated	0.77	None