Appendix for "Development and validation of a dynamic 48-hour in-hospital mortality risk stratification for COVID-19 in a UK teaching hospital: a retrospective cohort study" by Wiegand et al (2022)

eAppendix 1. Diagnostic testing used either a real-time reverse transcription polymerase chain reaction (RT-PCR) of the RdRp gene from a nasopharyngeal swab, or the SAMBA II point-of-care test used at the hospital[e1]. Clinical diagnosis of COVID-19 was identified using International Classification of Diseases 10th Edition (ICD-10) codes in the EHR.

eAppendix 2.

These studies were the TACTIC-E and TACTIC-R trials (ISRCTN11188345 https://doi.org/10.1186/ISRCTN11188345), the REMAP-CAP platform trial for intensive care patients (ISRCTN67000769 https://doi.org/10.1186/ISRCTN67000769), and the RECOVERY trial (ISRCTN50189673 https://doi.org/10.1186/ISRCTN50189673).

eAppendix 3.

For patients for whom a CFS score had not been recorded by the treating team, a consultant or specialist registrar in Geriatric Medicine reviewed the clinical records and assigned a CFS score using only information recorded at the time of admission[e2]. This approach has been shown to have good agreement with CFS scores assigned after face to face assessment (inter-rater reliability kappa 0.84)[e3].

eAppendix 4.

The following keywords were used to identify potentially relevant medical notes: end of life, end-of-life, supportive care, EOL anticipatory med, palliative, comfort care, end of his life, end of her life, terminal wean.

eAppendix 5.

Let $k_i \in \{0,\ldots,n_k\}$ be the event type of patient i, so that $T_{i,k}$ is patient i's corresponding event time.The probability of patient i with covariates $X(s)$ not experiencing any event before landmark s, and incurring event k within time $t \in [0,w]$of this landmark can therefore be calculated by:

$$\mathbb{P}(T_{i,k} < s + t \,|T_{i,k} \geq s, k_i = k, X(s)) = 1 - exp(-\int_{[0,t]} \tilde{\lambda}(u|X(s))du)$$

Here $\lambda(t|X(s))$is the sub-distribution hazard function for event k:

$$\lambda(t|X(s)) = \lambda_{k0}(t)\, exp(\beta^T X(s)),$$

with the subdistribution baseline hazard $\lambda_{k0}(t)$ for event k at time $t \in [0, w]$. We report estimated values for β in Table 2. We report in eTable 3 the estimated cumulative baseline sub-distribution hazard function $\int_{[0,t]} \lambda_{k0}(u)\, du$, and in eTable 6 and eTable 8 for the sensitivity analyses.

To derive the 48-hour mortality probability $(k_i = k_{mort},\ w = 48h)$ from the Fine-Gray model, we therefore compute the probability of the mortality occurring between the landmarking time *s* and the end of the prediction horizon *s*+*w*, given the patient did not have any event prior to the landmark and accounting for the covariates $X(s)$collected at the landmark time s.

$$\mathbb{P}(T_{i,k} < s + w | T_{i,k} \geq s, k_i = k_{mort}, X(s)) = 1 - exp(-\int_{[0,w]} \lambda(t|X(s))dt)$$

To allow for easier access a web-app is available on http://shiny.mrc-bsu.cam.ac.uk/apps/covid19mortalityrisk/ that calculates the 48-hour mortality probability based on user input.

eReferences

[e1] Assennato SM, Ritchie AV, Nadala C, et al. Performance Evaluation of the SAMBA II SARS-CoV-2 Test for Point-of-Care Detection of SARS-CoV-2. J Clin Microbiol 2020; 59(1): e01262-20. http://doi.org/10.1128/JCM.01262-20.

[e2] Osuafor, CN, Davidson C, Mackett AJ, et al. Clinical Features, Inpatient Trajectories and Frailty in Older Inpatients with COVID-19: A Retrospective Observational Study. *Geriatrics* 2021; 6(1): 11. http://doi.org/10.3390/geriatrics6010011

[e3] Marincowitz C, Turner V, Allgar V, et al. Can Patient Frailty Be Estimated from Inpatient Records? A Prospective Cohort Study. *Adv Geriatr Med Res*. 2020; 2(1): e200004. https://doi.org/10.20900/agmr20200004

eTable 1. Complete list of candidate predictors, summary statistics and missingness for the development dataset.

Marker	**Unit**	**Summary measure/coding**	**Summary across landmark times** [a]	**Missingness across landmark times** [b]
Demographics				
Age at presentation	Years		69 [55,81]	– (0%)
		<45	517(7.6%)	–
		<50	853 (12.5%)	–
		<55	1386 (20.2%)	–
		<60	2164 (31.6%)	–
		<65	2779 (40.6%)	–
		<70	3371 (49.2%)	–
		<75	4284 (62.6%)	–
		<80	5236 (76.5%)	–
		<85	5857 (85.6%)	–
		<90	6315 (92.3%)	–
		<95	6670 (97.4%)	–
Sex	Female/ Male		41.4% / 58.6%	– (0%)
Ethnicity		Not included		
White	yes/no	White British/ White Irish/ Other White background	5215 (76.2%)	– (16.3%)
Asian	yes/no	Asian Indian/ Asian Pakistani/ Asian Bangladeshi/ Other Chinese/ Other Asian background	225 (3.3%)	– (16.3%)
Black	yes/no	Black Carribean/ Black African/	155 (2.3%)	– (16.3%)

		Other Black background		
Other	yes/no	Other ethnic group/ Mixed White and Black Carribean/ Mixed White and Black African/ Mixed White and Asian/ Other mixed background	137 (2.0%)	– (16.3%)
Body Mass Index (BMI)	kg/m^2	Not included	27.3 [22.5, 30.3]	– (6.1%)
Underweight	kg/m^2	18.5 - (Most recent BMI), or 0 if most recent BMI above 18.5	93.5% = 0 After excluding zero: 1.4 [0.5, 1.9]	– (6.1%)
Overweight	kg/m^2	(Most recent BMI) - 25, or 0 if most recent BMI below 25	38% = 0 After excluding zero: 4.4 [2.3, 9.1]	– (6.1%)
Clinical Frailty Scale [c]		Value	5 [3, 6]	– (54.5%)
Comorbidities				
Asthma	yes/no	Documented history of	780 (11.4%)	-
Dementia	yes/no	Documented history of	353 (5.2%)	-
Diabetes	yes/no	Documented history of	1233 (18.0%)	-
Chronic heart disease	yes/no	Documented history of	1260 (18.4%)	-

Hypertension	yes/no	Documented history of	2193 (32.0%)	-
Immunocompromised	yes/no	Documented history of	80 (1.1%)	-
Chronic liver disease	yes/no	Documented history of	640 (9.4%)	-
Non-haematological malignancy	yes/no	Documented history of	576 (8.4%)	-
Haematological malignancy	yes/no	Documented history of	284 (4.1%)	-
Chronic kidney disease	yes/no	Documented history of	502 (7.3%)	-
Respiratory disease	yes/no	Documented history of	833 (12.2%)	-
Stroke	yes/no	Documented history of	220 (3.2%)	-
Observations				
Heart rate (HR)	Beats/min	24h mean	83 [73, 93]	17.3 (0.0%)
		24h min	72 [63, 82]	
		24h max	94 [83, 106]	
		Trend	0 [-4.5, 4]	– (6.3%)
Mean arterial pressure	mmHg	24h mean	86 [79, 94]	17.1 (0.0%)
		24h min	74 [66, 83]	
		24h max	100 [91, 109]	
		Trend	0.0 [-0.4, 0.4]	– (6.3%)
Temperature	Degrees Celsius	24h mean	37.0 [36.7, 37.3]	9.3 (0.0%)
		24h min	36.4 [36.1, 36.7]	

		24h max	37.5 [37.1, 38.1]	
		Trend	0 [-0.3, 0.2]	– (6.3%)
Respiratory Rate (RR)	Breaths/min	24h mean	18.5 [17, 21]	18.8 (0.0%)
		24h min	16 [15, 18]	
		24h max	20 [19, 26]	
		Trend	0 [-1,1]	– (6.3%)
SpO2/FiO2 ratio		24h mean	431 [325, 456]	12.8 (0.0%)
		24h min	392 [250, 448]	
		24h max	457 [443, 467]	
		Trend	0 [-7.0, 7.4]	– (6.3%)
P/F ratio	mmHg	24h mean	184 [136, 250]	1.5 (77.9%)
		24h min	140 [98, 201]	
		24h max	229 [171, 310]	
		Trend	2 [-18, 24]	– (80.3%)
Glasgow coma scale (GCS)	Lowest GCS in the last 24h	<9	33.8%	–
		<12	47.0%	–
Laboratory tests				
Urea	mmol/L	Most recent measurement during last 48h	8.8 [5.6, 14.1]	0.9 (38.0%)
Creatinine	μmol/L	Most recent measurement during last 48h	70 [52, 106]	0.9 (25.8%)
		Trend	-1 [-7, 4]	– (43.4%)
Sodium	mmol/L	Not included	138.6 [135.5, 142]	2.7 (24.8%
		Trend	0.0 [-1.0, 1.5]	– (41.9%)
Hyponatraemia	Na < 135 mmol/L	135 - (lowest sodium during last 24h), or 0 if all above 135	82% = 0 After excluding zero: 2 [1, 4]	2.7 (24.8%)

Hypernatraemia	Na > 145 mmol/L	(highest sodium during last 24h) - 145, or 0 if all below 145	85.2% = 0 After excluding zero: 3.8 [2, 6.2]	
Potassium	mmol/L	Most recent measurement during last 24h	4.1 [3.7, 4.4]	2.7 (25.0%)
		Trend	0 [-0.2, 0.2]	– (42.1%)
Albumin	g/L	Most recent measurement during last 48h	24 [20, 28]	1.2 (33.6%)
Alanine Transaminase (ALT)	U/L	Most recent measurement during last 48h	36 [22, 61]	0.7 (37.2%)
Alkaline phosphatase (ALP)	U/L	Most recent measurement during last 48h	100 [73, 149]	2.3 (19.8%)
Bilirubin	μmol/L	Most recent measurement during last 48h	8 [5, 13]	0.7 (37.4%)
Lactate dehydrogenase (LDH)	U/L	Most recent measurement during last 48h	335 [261, 436]	0.2 (80.5%)
C-reactive protein (CRP)	mg/L	Most recent measurement during last 48h	56 [22, 131]	1.6 (12.8%)
		Trend	0 [-0.2, 0.3]	– (45.9%)
Procalcitonin (PCT)	ng/ml	Most recent measurement during last 48h	0.24 [0.08, 0.83]	0.2 (84.4%)
Ferritin	μg/L	Most recent measurement	726 [336, 1427]	0.3 (76.6%)

		during last 48h		
Haemoglobin	g/L	Most recent measurement during last 48h	104 [89, 122]	5.4 (12.4%)
		Trend	-1 [-5, 3]	– (43.9%)
White cell count (WCC)	10^9/L	Most recent measurement during last 48h	7.9 [5.7, 10.6]	1.6 (12.7%)
		Trend	0 [-1, 1]	– (46.1%)
Neutrophils	10^9/L	Most recent measurement during last 48h	5.7 [3.9, 8.2]	1.6 (13.4%)
Lymphocytes	10^9/L	Most recent measurement during last 48h	1.1 [0.7, 1.5]	1.6 (13.4%)
Neutrophil-Lymphocytes ratio	Ratio	Most recent measurement during last 48h	5.4 [3.2, 9.5]	1.6 (13.5%)
Eosinophils	10^9/L	Most recent measurement during last 48h	0.1 [0.02, 0.28]	1.6 (14.1%)
Monocytes	10^9/L	Most recent measurement during last 48h	0.45 [0.3, 0.64]	1.6 (13.5%)
Platelets	10^9/L	Most recent measurement during last 48h	280 [193, 387]	1.6 (12.8%)
		Trend	3 [-17, 26]	– (46.3%)
Red cell distribution width (RDW)	%	Most recent measurement during last 48h	15.1 [14, 16.4]	1.6 (13.3%)
Prothrombin Time	sec	Most recent measurement	13.3 [12.5, 14.5]	0.84 (52.6%)

		during last 48h		
Activated partial thromboplastin time (APTT)	sec	Most recent measurement during last 48h	32.3 [29.6, 35.3]	0.84 (53.8%)
D-Dimer	ng/ml	Most recent measurement during last 48h	552 [284, 1677]	0.4 (71.9%)
Troponin	ng/L	Most recent measurement during last 48h	17 [5.6, 48.7]	0.3 (80.5%)
Interferon Gamma (IG)	pg/ml	Most recent measurement during last 48h	0.9 [0.9, 2.5]	0.2 (84.2%)
TNF-Alpha (TNFA)	pg/ml	Most recent measurement during last 48h	12.3 [8.3, 18.2]	0.2 (84.2%)
Interleukin-1 beta (IL-1)	pg/ml	Most recent measurement during last 48h	0.5 [0.3, 0.9]	0.2 (84.2%)
Interleukin-6 (IL-6)	pg/ml	Most recent measurement during last 48h	13.6 [4.7, 31.9]	0.3 (84.0%)
Interleukin-10 (IL-10)	pg/ml	Most recent measurement during last 48h	1.88 [0.7, 4.4]	0.2 (84.2%)
Interleukin ratio (IL-ratio, IL6/ IL10)	Ratio	Most recent measurement during last 48h	7.6 [2.9, 20.1]	0.2 (84.3%)
Lactate	mmol/L	Most recent measurement during last 48h	1.3 [1.0, 1.7]	3.7 (60.4%)

pH – arterial or (venous + 0.03)		Not included	7.41 [7.36, 7.44]	1.9 (66.4%)
Acidosis	pH-value < 7.35	7.35 - (lowest pH during last 24h), or 0 if all above 7.35	67.1% = 0 After excluding zero: 0.06 [0.028,0.107]	1.9 (66.4%)
Alkalosis	pH-value > 7.45	(Highest pH during last 24h) - 7.45, or 0 if all below 7.45	66.8%= 0 After excluding zero: 0.024 [0.011, 0.039]	
Treatments, interventions and level of care				
Visited ICU	yes/no	During last 24h	1789 (26.1%)	–
Mechanically ventilated	yes/no	During last 24h	1420 (20.7%)	–
Cardiovascular support	yes/no	During last 24h	705 (10.3%)	–
Renal replacement therapy	yes/no	During last 24h	348 (5.1%)	–
Steroids (oral or intravenous; dexamethasone, hydrocortisone, prednisolone, methylprednisolone)	yes/no	Ever during this hospital visit up to now	2770 (40.5%)	–

[a] For yes/no items shown as number (%) across landmark times; for quantitative items shown as median [IQR] across landmark times

[b] Shown as mean number of measurements per landmark (% landmarks with no measurement)

[c] For 45 patients for whom no CFS score had been recorded by the treating team, a consultant or specialist registrar in Geriatric Medicine reviewed the clinical records and assigned a CFS score using only information recorded at the time of admission.

eTable 2. ICD-10 codes used to identify comorbidities.

Diagnosis	ICD-10 codes	Description
Hypertension	I10	Essential hypertension
	I11	Hypertensive heart disease
	I12	Hypertensive renal disease
	I13	Hypertensive heart and renal disease
	I15	Secondary hypertension
Diabetes	E10	Type 1 diabetes mellitus
	E11	Type 2 diabetes mellitus
	E12	Malnutrition-related diabetes mellitus
	E13	Other specified diabetes mellitus
	E14	Other unspecified diabetes mellitus
Chronic liver disease	K70	Alcoholic liver disease
	K71	Toxic liver disease
	K72	Hepatic failure, not elsewhere classified
	K73	Chronic hepatitis, not elsewhere classified
	K74	Fibrosis and cirrhosis of the liver
	K75	Other inflammatory diseases of the liver
	K76	Other diseases of the liver
	K77	Liver disorders in disease classified elsewhere
Asthma	J45	Asthma
Non-haematological malignancy	C0	Malignant neoplasm of lip
	C1	Malignant neoplasm of base of tongue
	C2	Malignant neoplasm of other unspecified parts of tongue
	C3	Malignant neoplasm of gum
	C4	Malignant neoplasm of floor of mouth
	C5	Malignant neoplasm of palate
	C6	Malignant neoplasm of other and unspecified parts of mouth
	C7	Malignant neoplasm of parotid gland

Haematological malignancy	C8	Malignant neoplasm of other and unspecified major salivary glands
	C9	Malignant neoplasm of tonsil
Stroke	I63	Cerebral infarction
	I65	Occlusion and stenosis of precerebral arteries, not resulting in cerebral infarction
	I66	Occlusion and stenosis of cerebral arteries, not resulting in cerebral infarction
Chronic kidney disease	N18.1-N18.5	Chronic kidney disease stage 1-5
	N18.9	Chronic kidney disease, unspecified
	I13	Hypertensive and renal disease
Chronic heart disease	I20	Angina pectoris
	I21	Acute myocardial infarction
	I22	Subsequent myocardial infarction
	I23	Certain current complications following acute myocardial infarction
	I24	Other acute ischaemic heart diseases
	I25	Chronic ischaemic heart disease
	I34	Nonrheumatic mitral valve disorders
	I35	Nonrheumatic aortic valve disorders
	I36	Nonrheumatic tricuspid valve disorders
	I37	Pulmonary valve disorders
	I42	Cardiomyopathy
	I43	Cardiomyopathy in diseases classified elsewhere
	I44	Atrioventricular and left bundle-branch block
	I50	Heart failure
Immunocompromised	D80	Immunodeficiency with predominantly antibody defects
	D81	Combined immunodeficiencies
	D82	Immunodeficiency associated with other major defects
	D83	Common variable immunodeficiency
	D84	Other immunodeficiencies
Dementia	F01	Vascular dementia

	F02	Dementia in other diseases classified elsewhere
	F03	Unspecified dementia
	G30, G31	Alzheimer disease & Other degenerative diseases of nervous system, not elsewhere classified
	F10.27	Alcohol dependence, with alcohol-induced persisting dementia
	F10.97	Alcohol use, unspecified with alcohol-induced persisting dementia
	F19.97	Other psychoactive substance use, unspecified with psychoactive substance-induced persisting dementia
Respiratory disease	I27	Other pulmonary heart diseases
	J6*-J7*	Lung diseases due to external agents
	J41	Simple and mucopurulent chronic bronchitis
	J42	Unspecified chronic bronchitis
	J43	Emphysema
	J44	Other chronic obstructive pulmonary disease
	J47	Bronchiectasis

eTable 3: Baseline cumulative subdistribution hazards for mortality in the final model, as needed for calculation of the 48 hour survival probabilities (eAppendix 5).

Time after landmark (hours)	Cumulative subdistribution hazard	Time after landmark (hours)	Cumulative subdistribution hazard	Time after landmark (hours)	Cumulative subdistribution hazard	Time after landmark (hours)	Cumulative subdistribution hazard
1	0.00094	13	0.00852	25	0.02143	37	0.03339
2	0.00161	14	0.00906	26	0.02339	38	0.03480
3	0.00255	15	0.00942	27	0.02463	39	0.03559
4	0.00304	16	0.00963	28	0.02525	40	0.03582
5	0.00363	17	0.01109	29	0.02673	41	0.03707
6	0.00427	18	0.01140	30	0.02783	42	0.03778
7	0.00458	19	0.01220	31	0.02876	43	0.03867
8	0.00516	20	0.01434	32	0.03008	44	0.04101
9	0.00563	21	0.01563	33	0.03095	45	0.04200
10	0.00713	22	0.01674	34	0.03182	46	0.04322
11	0.00787	23	0.01821	35	0.03265	47	0.04481
12	0.00834	24	0.01962	36	0.03318	48	0.04625

eTable 4: Final model coefficients for landmarks less than 28 days from admission (or the first positive SARS-CoV-2 test if infection was nosocomial).

Predictor	**Coefficients when recorded**	**Coefficients if not recorded**[1]
Age <75 years, at admission	-0.269	–
Age <80 years, at admission	-0.135	–
Heart rate, beats/min, mean during last 24h	0.00154	–
Respiratory rate, breaths/min, minimum during last 24h	0.135	–
SpO2/FiO2 ratio, minimum during last 24h	-0.0114	–
WCC, 10^9/L, most recent measurement during last 48h	0.00169	-0.000359
Acidosis, 7.35 - (lowest pH during last 24h), or 0 if all above 7.35	5.97	1.66

[1] If the predictor value is not recorded (due to not being measured or documented in the EHR within the relevant time window), the fixed value in this column is used, and the coefficient corresponding to the predictor value is ignored.

eTable 5. Final model coefficients for model omitting all blood tests.

Predictor	**Coefficients when recorded**	**Coefficients if not recorded**[1]
Age <75 years, at admission	-0.683	–
Age <80 years, at admission	-0.195	–
Clinical Frailty Score, at admission	0.193	-0.170
Heart rate, beats/min, mean during last 24h	0.0175	–
Respiratory rate, breaths/min, minimum during last 24h	0.0570	–
SpO2/FiO2 ratio, minimum during last 24h	-0.0125	–

[1] If the predictor value is not recorded (due to not being measured or documented in the EHR within the relevant time window), the fixed value in this column is used, and the coefficient corresponding to the predictor value is ignored.

eTable 6: Baseline cumulative subdistribution hazards for the alternative model without blood tests, as needed for calculation of the 48 hour survival probabilities (eAppendix 5).

Time after landmark (hours)	Cumulative subdistribution hazard	Time after landmark (hours)	Cumulative subdistribution hazard	Time after landmark (hours)	Cumulative subdistribution hazard	Time after landmark (hours)	Cumulative subdistribution hazard
1	0.000687	13	0.006248	25	0.015666	37	0.024447
2	0.00118	14	0.006647	26	0.017095	38	0.02549
3	0.001872	15	0.006911	27	0.018004	39	0.026075
4	0.002229	16	0.007063	28	0.018459	40	0.026245
5	0.002662	17	0.008136	29	0.019544	41	0.027172
6	0.003129	18	0.008366	30	0.020346	42	0.027697
7	0.003357	19	0.008946	31	0.021037	43	0.028356
8	0.003784	20	0.010495	32	0.022007	44	0.030097
9	0.00413	21	0.011433	33	0.022648	45	0.030851
10	0.005232	22	0.012245	34	0.023292	46	0.031778
11	0.005773	23	0.013308	35	0.0239	47	0.032995
12	0.006119	24	0.014341	36	0.024293	48	0.034088

eTable 7. Model coefficients for the alternative model with IL-6 replaced by CRP and re-calculating the model coefficients through the same penalised likelihood function used in the SCAD algorithm.

Predictor	**Coefficients when recorded**	**Coefficients if not recorded[1]**
Age <75 years, at admission	-0.115	–
Age <80 years, at admission	-0.0582	–
Clinical Frailty Score, at admission	0.0672	0.150
Heart rate, beats/min, mean during last 24h	0.0128	–
Respiratory rate, breaths/min, minimum during last 24h	0.0515	–
SpO2/FiO2 ratio, minimum during last 24h	-0.00346	–
WCC, 10^9/L, most recent measurement during last 48h	0.00239	-0.116
Acidosis, 7.35 - (lowest pH during last 24h), or 0 if all above 7.35	2.73	0.474
C-reactive protein, pg/ml, most recent measurement during last 48h	-0.0000350	0.220

[1] If the predictor value is not recorded (due to not being measured or documented in the EHR within the relevant time window), the fixed value in this column is used, and the coefficient corresponding to the predictor value is ignored.

eTable 8: Baseline cumulative subdistribution hazards for the alternative model with IL-6 replaced by CRP, as needed for calculation of the 48 hour survival probabilities (eAppendix 5).

Time after landmark (hours)	Cumulative subdistribution hazard	Time after landmark (hours)	Cumulative subdistribution hazard	Time after landmark (hours)	Cumulative subdistribution hazard	Time after landmark (hours)	Cumulative subdistribution hazard
1	0.00010	13	0.00091	25	0.00224	37	0.00342
2	0.00017	14	0.00097	26	0.00243	38	0.00355
3	0.00028	15	0.00101	27	0.00255	39	0.00363
4	0.00033	16	0.00103	28	0.00262	40	0.00365
5	0.00039	17	0.00118	29	0.00276	41	0.00378
6	0.00046	18	0.00122	30	0.00287	42	0.00384
7	0.00049	19	0.00130	31	0.00296	43	0.00393
8	0.00056	20	0.00152	32	0.00309	44	0.00416
9	0.00061	21	0.00165	33	0.00318	45	0.00425
10	0.00077	22	0.00176	34	0.00326	46	0.00437
11	0.00084	23	0.00191	35	0.00334	47	0.00452
12	0.00089	24	0.00205	36	0.00340	48	0.00466

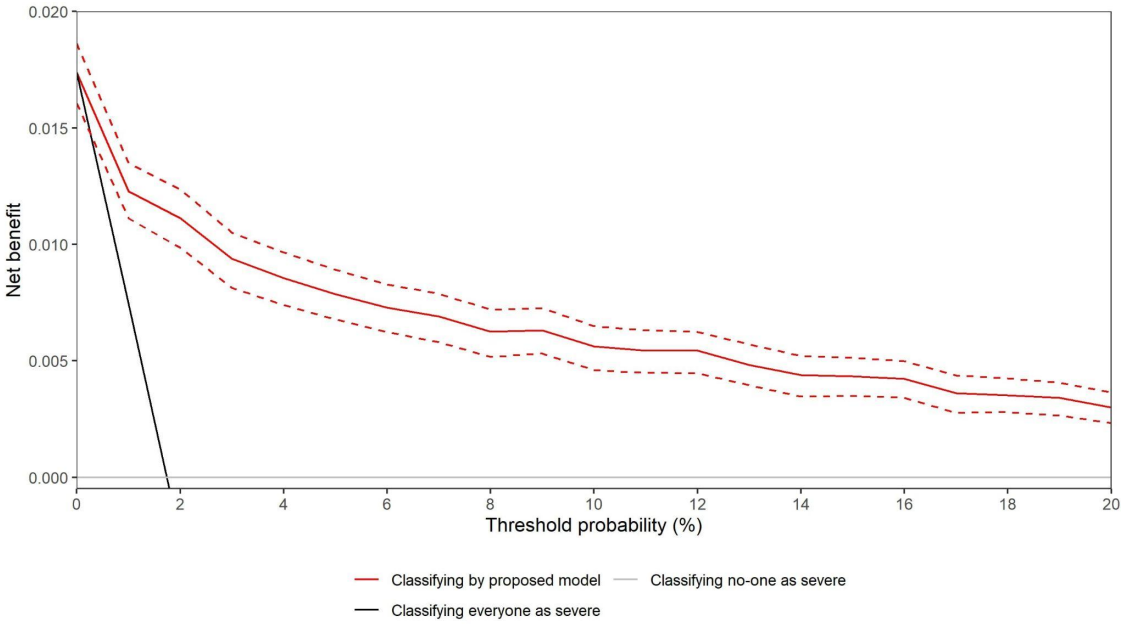
eTable 9. Final model coefficients for 72 hour prediction horizon

Predictor	**Coefficients when recorded**	**Coefficients if not recorded[1]**
Age <75 years, at admission	-0.564	–
Age <80 years, at admission	-0.183	–
History of non-haematological malignancy	0.146	–
Clinical Frailty Score, at admission	0.0721	0.0544
Respiratory rate, breaths/min, minimum during last 24h	0.100	–
SpO2/FiO2 ratio, minimum during last 24h	-0.0111	–
WCC, 10^9/L, most recent measurement during last 48h	0.00806	-0.0198[a]
Acidosis, 7.35 - (lowest pH during last 24h), or 0 if all above 7.35	1.29	0.0.0898
Platelets, 10^9/L, most recent measurement during last 48h	-0.000375	-0.0198[a]

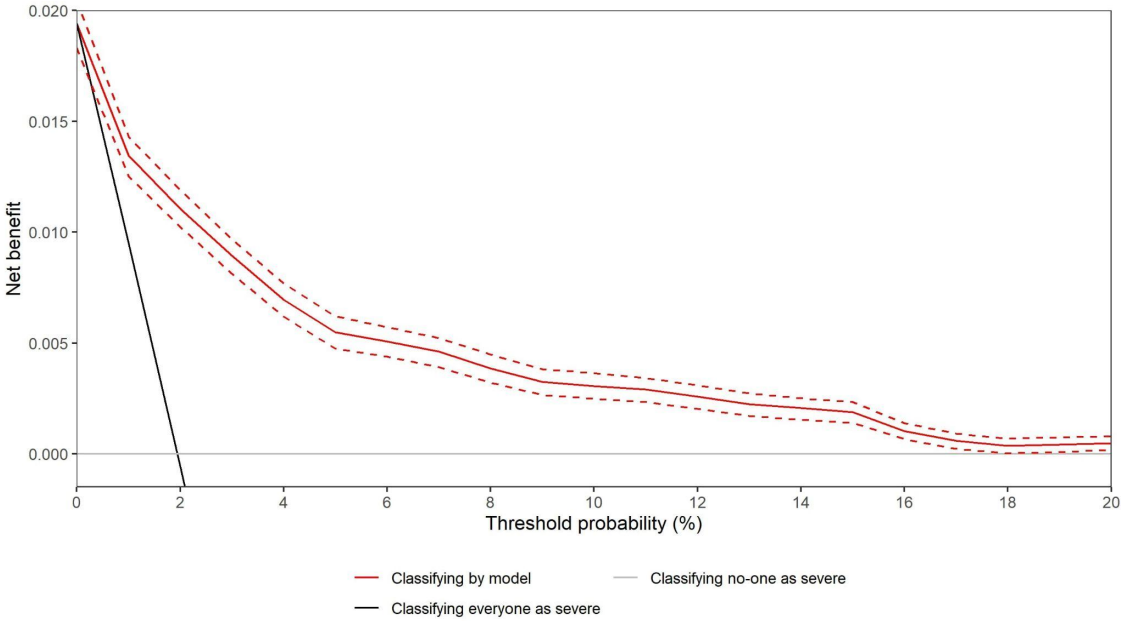
[a] WCC and Platelets are measured on the same sample, therefore the missingness for both clinical parameters is shared.

[1] If the predictor value is not recorded (due to not being measured or documented in the EHR within the relevant time window), the fixed value in this column is used, and the coefficient corresponding to the predictor value is ignored.

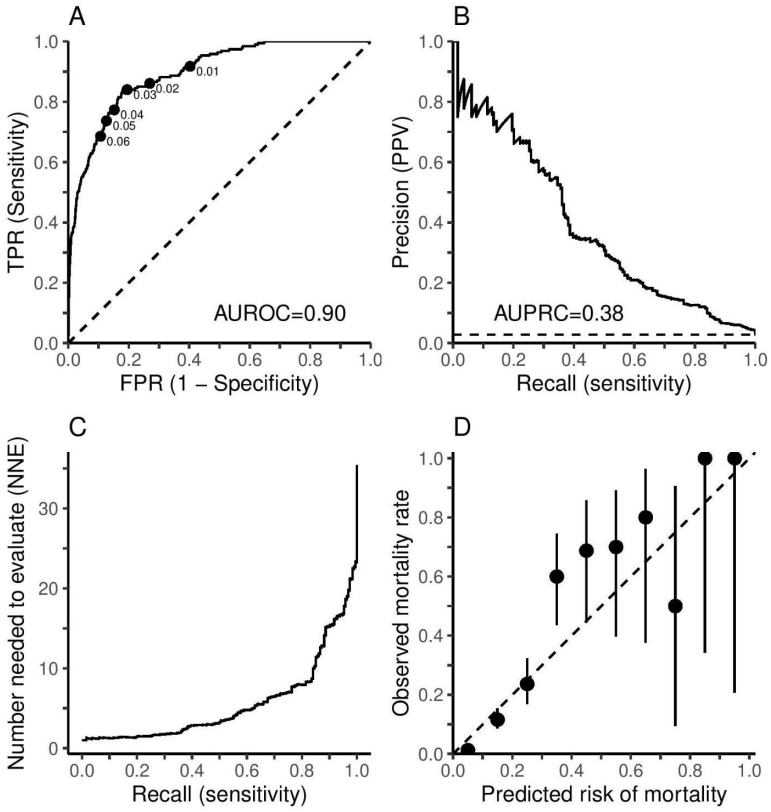
eFigure 1. Net benefit curve for risk stratification in the training dataset using the proposed model and by classifying either everyone or no-one as high risk patients. The dashed line shows 95% CI.



eFigure 2. Net benefit curve for risk stratification in the test dataset using the proposed model and by classifying either everyone or no-one as high risk patients. The dashed line shows 95% CI.



eFigure 3. Performance metrics for in-hospital mortality in the training dataset with 72 hour prediction horizon. (A) Receiver operator characteristic plot, with labels indicating the corresponding threshold and the dashed line indicating the line of no discrimination. (B) Precision-recall plot, with the 2.8% observed incidence indicated by the dashed line. (C) Number needed to evaluate against sensitivity. (D) Calibration plot (with 95% CI), by tenths of predicted risk, with the dashed line indicating perfect calibration.



eFigure 4. Performance metrics for in-hospital mortality in the test dataset with 72 hour prediction horizon. (A) Receiver operator characteristic plot, with labels indicating the corresponding threshold and the dashed line indicating the line of no discrimination. (B) Precision-recall plot, with the 3.1% observed incidence indicated by the dashed line. (C) Number needed to evaluate against sensitivity. (D) Calibration plot (with 95% CI), by tenths of predicted risk, with the dashed line indicating perfect calibration.