Table 1*: A multivariable predictive model for 30-day mortality using logistic regression in 4867 patients.

Variable	No. of patients (%)	30-day mortality (%)	OR (95% CI)*	% missing
Barthel index at admission				28.4%
≥75	1556 (44.6%)	60 (3.9%)	1	
50-74	912(26.2%)	76 (8.3%)	1.52 (1.07-2.16)	
25-49	614 (17.6%)	98 (16.0%)	2.34 (1.61-3.38)	
<25	404 (11.6%)	125 (30.9%)	3.99 (2.69-5.92)	
Systolic blood pressure (mm Hg)				2.0%
≥155	1443 (30.3%)	89 (6.2%)	1	
140-154	991 (20.8%)	81 (8.2%)	1.52 (1.08-2.15)	
125-139	986 (20.7%)	105 (10.7%)	2.06 (1.48-2.86)	
110-124	845 (17.7%)	114 (13.5%)	2.56 (1.85-3.56)	
95-109	357 (7.5%)	56 (15.7%)	2.52 (1.67-3.78)	
<95	146 (3.1%)	41 (28.1%)	3.03 (1.82-5.06)	
Age (years)				0.3%
<75	1227 (25.3%)	61 (5.0%)	1	
75-79	911 (18.8%)	71 (7.8%)	1.59 (1.08-2.33)	
80-84	1116 (23.0%)	112 (10.0%)	1.74 (1.22-2.49)	
85-89	1054 (21.7%)	139 (13.2%)	1.72 (1.21-2.45)	
>=90	546 (11.3%)	117 (21.4%)	2.62 (1.79-3.83)	
NT-proBNP (pg/mL)				59.8%
<8000	1412 (72.2%)	84 (6.0%)	1	
8000-15999	285 (14.6%)	38 (13.3%)	1.64 (1.08-2.49)	
16000-23999	110 (5.6%)	26 (23.6%)	2.04 (1.25-3.34)	
>24000	148 (7.6%)	42 (28.4.1%)	2.59 (1.68-3.99)	
Potassium (mEq/L)				4.9%
<3.5	249 (5.4%)	32 (12.9%)	1.48 (0.95-2.30)	
3.5-4.9	3536 (76.5%)	284 (8.0%)	1	
5-5.5	508 (11.0%)	73 (14.4%)	1.35 (0.98-1.87)	
>5.5	332 (7.2%)	78 (23.5%)	2.09 (1.48-2.94)	
Positive troponin level	1286 (45.1%)	198 (15.4%)	1.75 (1.32-2.30)	41.4%
NYHA class IV at admission	2148 (46.1%)	340 (15.8%)	1.63 (1.28-2.09)	4.2%
Respiratory rate (breaths/min)				29.5%
<25	2305 (67.2%)	189 (8.2%)	1	
25-29	540 (15.7%)	76 (14.1%)	1.35 (0.96-1.88)	
>=30	585 (17.1%)	109 (18.6%)	1.69 (1.23-2.32)	
Low output symptoms*	792 (17.5%)	161 (20.3%)	1.48 (1.15-1.90)	6.9%
Oxygen saturation (%)				4.0%
95-100	1830 (39.2%)	127 (6.9%)	1	
90-94	1675 (35.8%)	159 (9.5%)	1.19 (0.90-1.56)	
84-89	689 (14.7%)	98 (14.2%)	1.34 (0.97-1.86)	
<85%	479 (10.3%)	98 (20.5%)	1.67 (1.18-2.36)	
Episode associated with ACS**	134 (2.8%)	36 (26.9%)	2.02 (1.25-3.27)	2.9%
Hypertrophy at ECG**	290 (6.2%)	38 (13.1%)	1.59 (1.05-2.40)	3.4%
Creatinine (mg/dL)				1.8%
<1.5	3401 (71.1%)	263 (7.7%)	1	
1.5-2.4	1054 (22.1%)	156 (14.8%)	1.27 (0.99-1.64)	
>=2.5	326 (6.8%)	67 (20.6%)	1.46 (1.00-2.13)	

ACS is acute coronary syndrome; ECG, electrocardiogram; NYHA, New York Heart Association; OR, odds ratio.

* Defined by confusion, weakness, cold periphery and any sign: poor peripheral perfusion, anuria or oliguria.

**Defined by the presence of at least two of the following three criteria: symptoms of chest pain, ECG abnormalities, and positive tropoinin.

***Defined by the Sokolow-Lyon index.

‡ Multivariable predictive model for 30-day mortality using logistic regression. Each quantitative predictor variable has been grouped into appropriate categories. The odds ratio for each category is the change in the odds of dying within 30 days relative to the reference category (e.g. age<75 years). The coefficient for each variable can be obtained as the log (odds ratio). Multiple imputation using chained was used for missing data.

† The intercept was -5.40, which is the log (odds) of dying within 30 days for a patient who is in the reference category of every variable. Such a patient has the most favourable characteristics possible and has a very low probability (0.5%) of dying within 30 days.

14 **Table 2 -** Analysis of 30-day mortality stratified by type of hospital (university vs community) and ED volume of

15 attendances (low-medium vs high volume)

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Risk Quintile	30-day mortality in university hospitals	30-day mortality in community hospitals	P-value*	30-day mortality in high-volume ED	30-day mortality in low/medium-volume ED	P-value**
Bottom quintile	6 (0.7%)	1 (0.7%)	0.65	2 (0.3%)	5 (1.3%)	0.74
2nd quintile	15 (1.8%)	3 (2.4%)		11 (1.8%)	7 (2.0%)	
3rd quintile	50 (5.9%)	8 (6.7%)		36 (6.0%)	22 (6.0%)	
4th quintile	83 (9.9%)	19 (15.5%)		64 (10.4%)	38 (10.8%)	
Next decile	86 (20.5%)	12 (19.1%)		66 (20.9%)	32 (19.3%)	
Top decile	193 (45.8%)	24 (38.7%)		142 (44.5%)	75 (45.7%)	

17 ED: emergency department
18 * P-value for Mantel Haenszel test. The c-statistic value for our model within university hospitals was 0.839
19 (95% CI 0.820-0.858), comparable to that obtained within community hospitals 0.812 (95% CI 0.761-0.862).
20 4193 patients were admitted to university hospitals (presenting 433 outcomes), whilst 626 patients were
21 admitted to community hospitals (presenting 67 outcomes)
22 ** P-value for Mantel Haenszel test. The c-statistic value for our model within high-volume hospital was 0.842
23 (95% CI 0.820-0.863), comparable to that obtained within medium/low-volume hospitals 0.824 (95% CI 0.791-
24 0.867). 3045 patients were admitted to high-volume hospitals (presenting 321 outcomes), whilst 1774 patients
25 were admitted to intermediate/low-volume hospitals (presenting 179 outcomes)
26

27   **Figure 1:** Risk score distribution (bars) and predicted 30-day mortality risk (line) from the model obtained in

28   the derivation cohort.
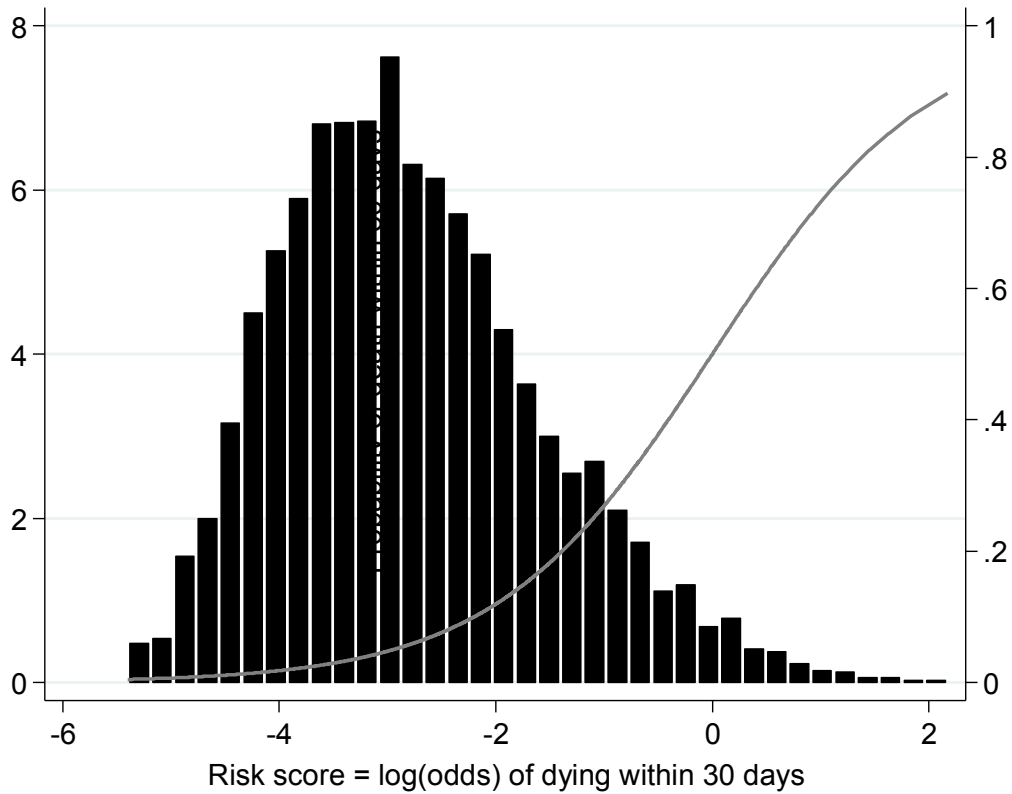
29

30   For a patient in the reference category of every variable in Table 1 the estimated log(odds) of dying within 30

31   days is -5.40 (Intercept of the logistic model), meaning that the risk of dying within 30 days for a patient at the

32   most extreme low risk (-5.40) is 0.5%. To calculate any individual patient's log(odds) of dying within 30 days

33   one adds up their relevant coefficients in table 1 on top of this intercept value. Call this x. Then their

34   probability of dying within 30 days is $e^x/(1 + e^x)$. To facilitate this calculation for any patient we provide a

35   website **http://bernalte.cat/calculadora/**

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40 **Figure 2:** Cumulative mortality for six risk groups. Risk groups 1–4 correspond to quintiles 1–4, with the top

41 quintile subdivided into two deciles.
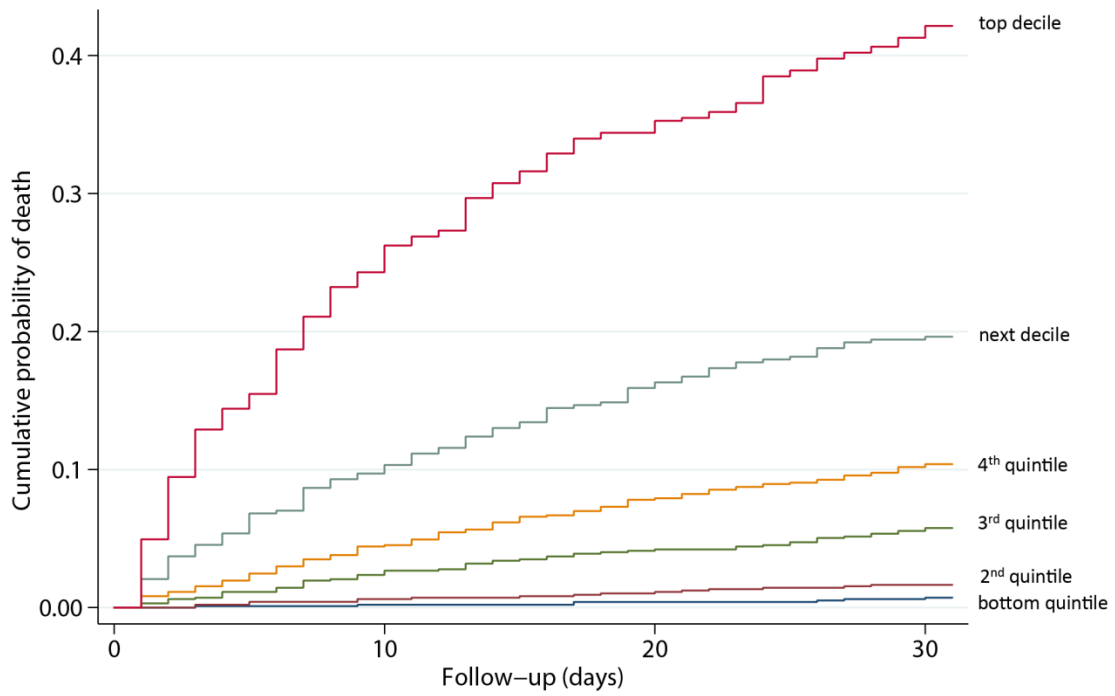
Risk		Intervals	N	Probability of dying within 30 days
Low		Bottom quintile	974	from 0.5% to 2.1%
		2nd quintile	973	from 2.1% to 3.9%
Intermediate		3rd quintile	974	from 3.9% to 7.0%
		4th quintile	973	from 7.0% to 14.5%
High		Next decile	487	from 14.5% to 25.7%
Very high		Top decile	486	from 25.8% to 89.8%

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46   **Figure 3:** Assessment of risk discrimination and model goodness-of-fit in six risk groups (4 quintiles and the

47   top 2 deciles) from low to very high risk for the derivation cohort (top) and for the validation cohort (bottom).

A. Derivation cohort

B. Validation cohort
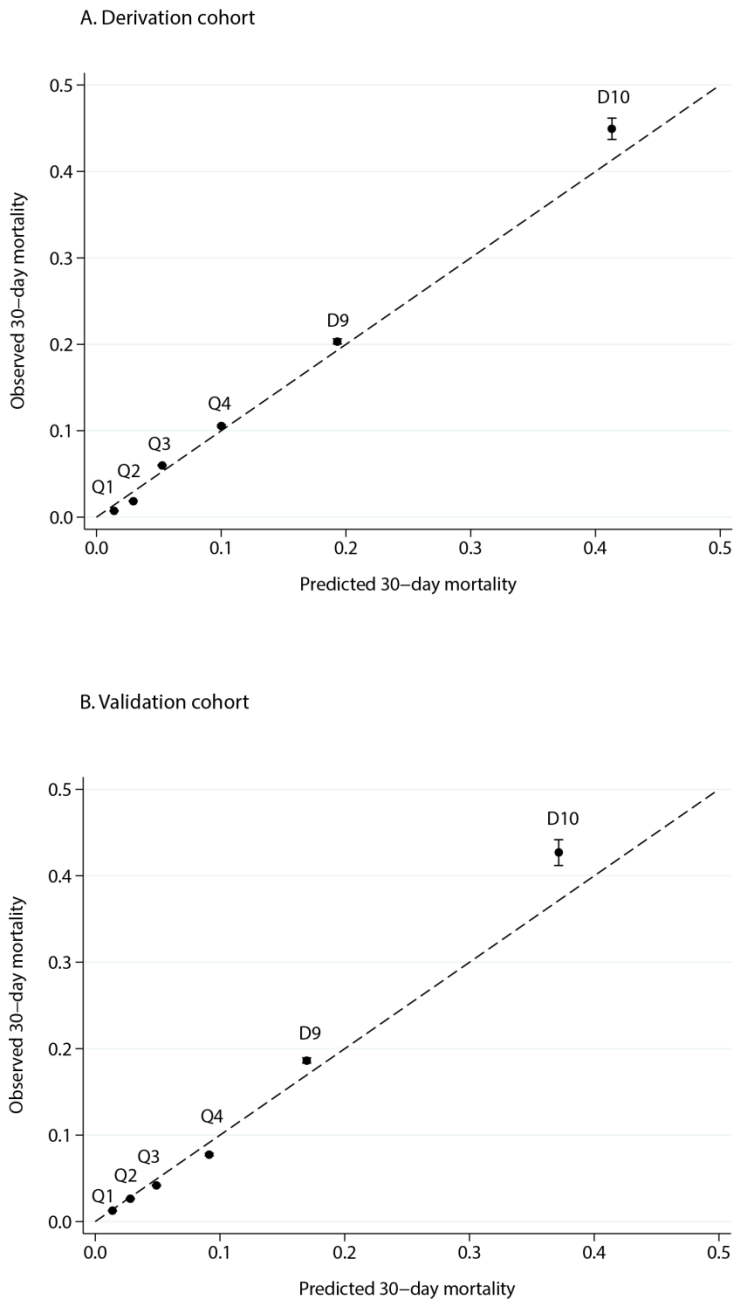
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49   Q1 to Q4 denote quintiles 1 to 4; D9 and 10 denote deciles 9 and 10.

50

81   **Table S1:** List of candidate predictor variables and units/definitions.

Demographics
- Age (years)
- Gender (male/female)
- Body mass index (Kg/m^2)

Vital signs
- Systolic blood pressure (mmHg)
- Diastolic blood pressure (mmHg)
- Heart rate (bpm)
- Respiratory rate (rpm)
- Arterial oxygen saturation (%)
- Temperature (ºC)

Transfer & Triage
- Triage level (severity)
- Type of transfer to Hospital
- Transfer to hospital with oxygen
- Transfer with diuretic, nitroglicerin or invasive ventilation

Medical history
- Hypertension
- Diabetes Mellitus
- Dyslipidemia
- Ischemic Heart Disease
- Chronic Renal Failure (Creatinine >2mg/dL)
- Cerebrovascular Disease
- Atrial fibrillation
- Peripheral Arterial Disease
- Valvular heart disease
- Chronic obstructive pulmonary disease
- Dementia
- Neoplasia
- Cirrhosis
- Current smoker
- Prior congestive heart failure

- Prior echocardiography
- Type of ventricular dysfunction
- Left ventricular ejection fraction in the most recent echocardiogram (no older than 1 year before patients inclusion)

Medical-social history
- Incontinence
- Hearing impairment
- Social support
- Prior falls

Status at admission
- Type of acute heart failure
- Symptoms of low output
- Cold skin
- Cutaneous pallor
- Delayed capillary refill
- Livedo reticularis
- Stupor or anxiety
- Dyspnea
- Ortopnea
- Paroxysmal nocturnal dyspnea
- Jugular venous pressure increased
- Hepatomegaly
- Edema
- Tachycardia
- Third sound auscultation
- Pulmonary rales
- Cardiomegaly (by chest Rx)
- Pleural effusion

Scores
- Barthel index at baseline
- Barthel index at admission
- NYHA at baseline
- NYHA at admission

Precipitating factors
- Any precipitating factor
- Infection (precipitating factor)
- Fast Atrial Fibrillation (precipitating factor)
- Anemia (precipitating factor)
- Hypertensive crisis (precipitating factor)
- Non-compliance Treatment (precipitating factor)
- Others precipitating factors

Blood tests
- Hemoglobin (g/dL)
- Hematocrit (%)
- Red cell distribution width (%)
- White cells (number/mm3)
- Platelets (number/10e9/L)
- Platelets volume (fl)
- Glucose (mg/dL)
- Urea (mg/dL)
- Creatinine (mg/dL)
- Sodium (mEq/L)
- Potasium (mEq/L)
- Troponin
- BNP (pmol/L)
- NTproBNP (pmol/L)
- C-Reactive Protein (mg/dL)
- Procalcitonine
- pCO2 in arterial blood
- pH in arterial blood
- Lactic acid in blood (mmol/L)
-

ECG
- Sinus rhythm
- Atrial Fibrillation
- Left ventricular hypertrophy (according to Sokolow-Lyon index)
- Left bundle branch block
- Pacemaker rhythm

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3   **Table S2:** Collective descriptive missingness for key predictor variables in the whole both derivation
4   and validation cohorts.

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Variable (% missingness)	30-day mortality if missing value (%)	30-day mortality if non-missing value (%)	p-value
Barthel index at admission (28.4%)	526 (9.8%)	273 (10.3%)	0.44
Age (0.3%)	0 (0%)	799 (10.0%)	0.40
Systolic BP (2.0%)	18 (10.7%)	781 (9.9%)	0.73
NYHA class IV at admission (4.2%)	40 (11.3%)	759 (9.9%)	0.39
Potassium (4.9%)	45 (11.0%)	754 (9.9%)	0.48
NT-proBNP (59.8%)	478 (10.2%)	321 (9.6%)	0.44
Positive troponin level (41.4%)	335 (9.9%)	464 (10.0%)	0.92
Low output symptoms (6.9%)	29 (8.5%)	770 (10.0%)	0.38
Respiratory rate (29.5%)	213 (8.6%)	586 (10.5%)	0.007
Episode associated with ACS (2.9%)	128 (9.7%)	771 (9.9%)	0.89
Oxygen saturation (4.0%)	30 (8.8%)	769 (10.0%)	0.48
Creatinine (1.8%)	19 (13.8%)	780 (9.9%)	0.129
Hypertrophy at ECG (3.4%)	30 (11.5%)	769 (9.9%)	0.39

6

7   **Table S3:** Description of the AUC ROC for each reduced-model and the full MEESSI-AHF model.

Model	c-statistic (95% CI)
Full model	**0.836 (0.812-0.853)**
Without NT-ProBNP	0.821 (0.803-0.840)
Without troponin	0.829 (0.811-0.848)
Without Barthel	0.817 (0.797-0.836)
Without NT-ProBNP and troponin	0.812 (0.792-0.831)
Without NT-ProBNP and Barthel	0.796 (0.776-0.816)
Without troponin and Barthel	0.809 (0.789-0.829)
Without NT-ProBNP, troponin and Barthel	0.784 (0.762-0.805)

8
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Table S4: Comparison of key predictor variables between derivation and validation cohorts

| Variable	Derivation cohort	Validation cohort
Barthel index at admission, n (%)		
<25	404 (11.6%)	171 (8.8%)
25-49	614 (17.6%)	286 (14.7%)
50-74	912 (26.2%)	520 (26.7%)
≥75	1556 (44.6%)	971 (49.9%)
Systolic BP (mm Hg), n (%)		
≥155	1443 (30.3%)	873 (27.6%)
140-154	991 (20.8%)	747 (23.7%)
125-139	986 (20.7%)	681 (21.6%)
110-124	845 (17.7%)	570 (18.1%)
95-109	357 (7.5%)	210 (6.7%)
<95	146 (3.1%)	77 (2.4%)
Age (years), n (%)		
<75	1227 (25.3%)	783 (24.3%)
75-79	911 (18.8%)	580 (18.0%)
80-84	1116 (23.0%)	775 (24.0%)
85-89	1054 (21.7%)	657 (20.4%)
>=90	546 (11.3%)	429 (13.3%)
NT-proBNP (pg/mL), n (%)		
<8000	1412 (72.2%)	1060 (75.4%)
8000-15999	285 (14.6%)	195 (13.9%)
16000-23999	110 (5.6%)	61 (4.3%)
>24000	148 (7.6%)	90 (6.4%)
Potassium (mEq/L), n (%)		
<3.5	249 (5.4%)	150 (4.9%)
3.5-4.9	3536 (76.5%)	2397 (78.4%)
5-5.5	508 (11.0%)	311 (10.2%)
>5.5	332 (7.2%)	200 (6.5%)
Positive troponin level, n (%)	1286 (45.1%)	983 (53.5%)
NYHA class IV at admission, n (%)	2148 (46.1%)	1329 (43.2%)
Respiratory rate (bpm), n (%)		
<25	2305 (72.6%)	1575 (67.2%)
25-29	540 (11.6%)	252 (15.7%)
>=30	585 (15.8%)	342 (17.1%)
Low output symptoms, n (%)	792 (17.5%)	628 (19.5%)
Oxygen saturation (%), n (%)		
95-100	1830 (39.2%)	1292 (41.9%)
90-94	1675 (35.8%)	1098 (35.6%)
84-89	689 (14.7%)	398 (12.9%)
<85%	479 (10.3%)	294 (9.5%)
Episode associated with ACS, n (%)	134 (2.8%)	62 (2.0%)
Hypertrophy at ECG, n (%)	290 (6.2%)	61 (2.0%)
Creatinine (mg/dL), n (%)		
<1.5	3401 (71.1%)	2298 (72.3%)
1.5-2.4	1054 (22.1%)	676 (21.3%)
>=2.5	326 (6.8%)	203 (6.4%)

ACS is acute coronary syndrome; ECG, electrocardiogram; NYHA, New York Heart Association; OR, odds ratio.

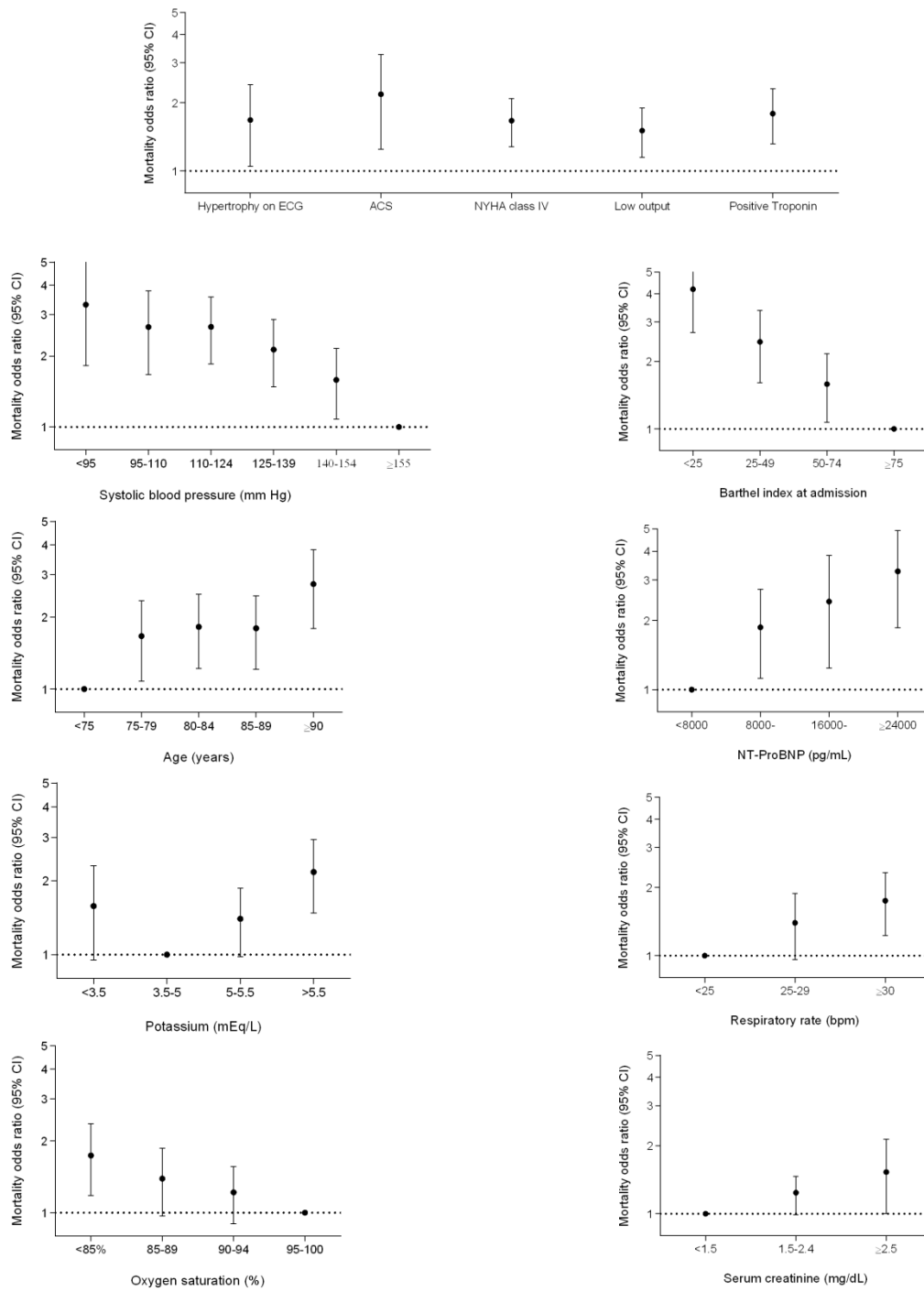15   **Figure S1:** Patient flow diagram

16
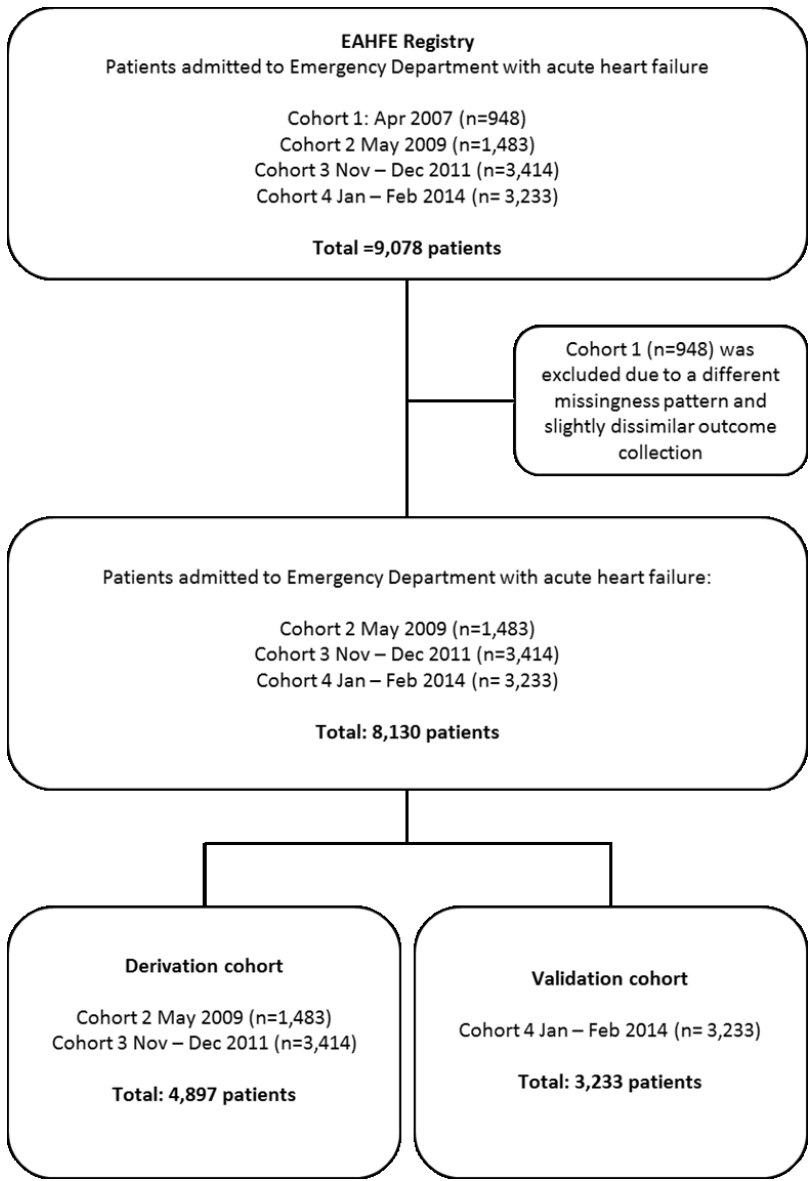
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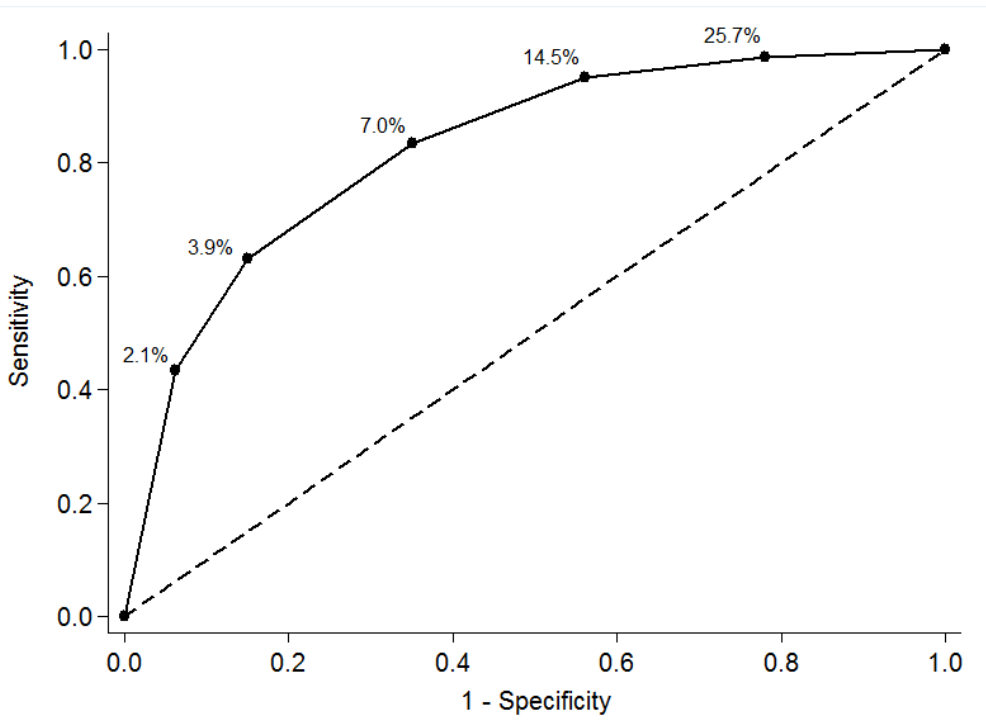19 **Figure S2:** Mortality odds ratios for each variable in the predictive model*.

20

21 *Each odds ratio is adjusted for all other variables in the model.

22

23   **Figure S3:** Receiver-operating characteristic curve, with predicted risk labelled on the curve.
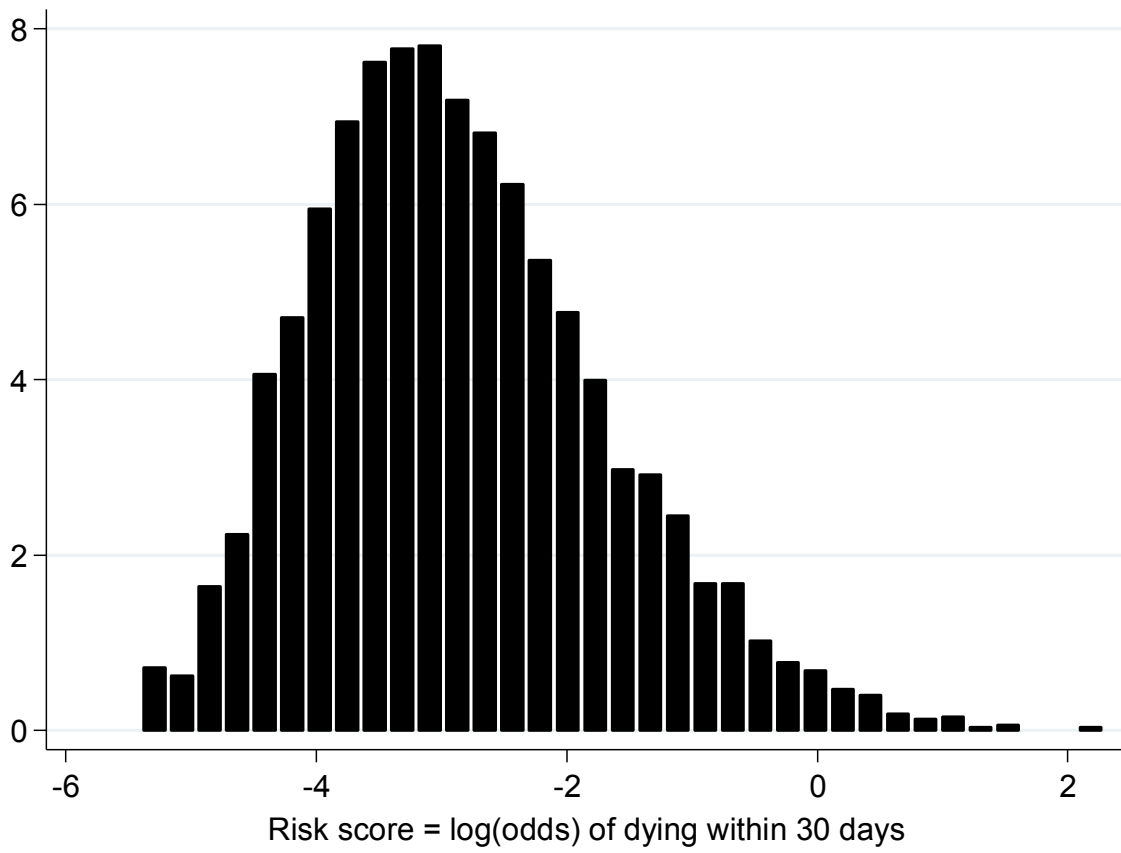

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26   Receiver operating characteristic curve for risk 30-day mortality. Sensitivity and specificity of the risk threshold
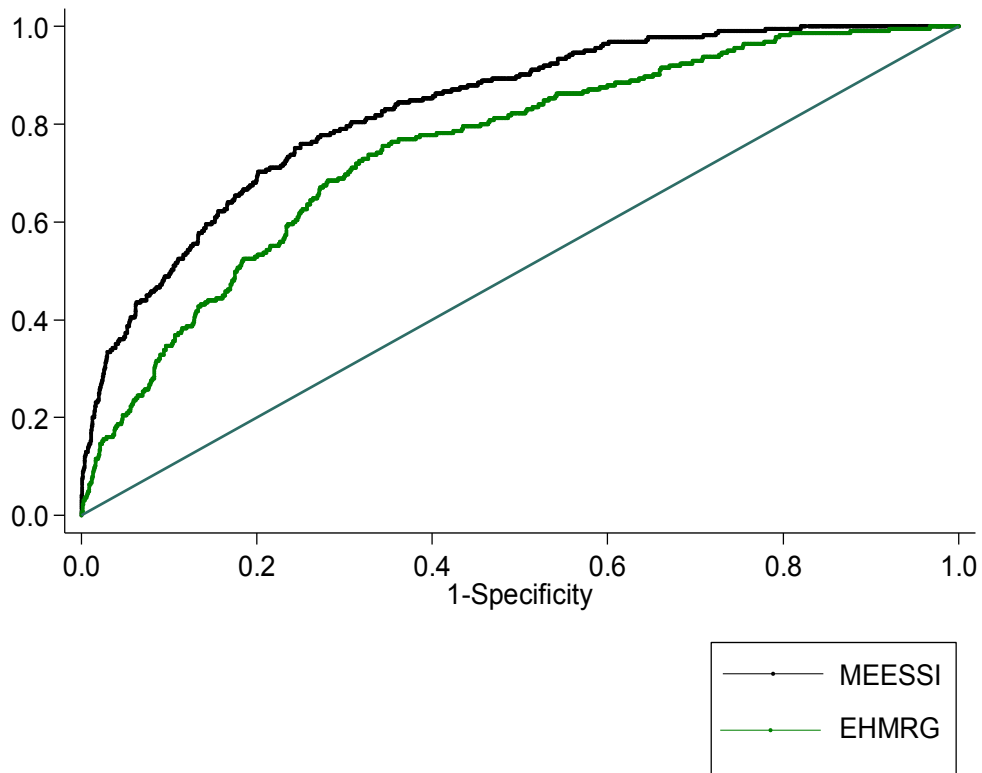27   for each category of the prediction model are plotted.

28

29 **Figure S4:** Risk score distribution (bars) in the validation cohort.

Risk score = log(odds) of dying within 30 days

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32 **Figure S5:** Comparison between the MEESSI-AHF and the EHMRG score

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34 Of note, EHMRG score was conceived to predict 7-day and MEESSI predicts 30-day mortality. Between both
35 validation and derivation cohorts, 2137 patients had available data to calculate the EHMRG score and therefore
36 to perform the comparison between risk scores. The c-statistic for our model was 0.830 (95% CI: 0.804-0.857)
37 and for EHMRG was 0.750 (95% CI: 0.719-0.783) (P-value for DeLong test P<0.001)

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