Supplementary Appendix

Additional methods

This appendix describes how the first-day laboratory frailty index (FI-Lab) and severity comparators were constructed, how mortality predictions were evaluated, and how supporting analyses address measurement availability, comparator choice, and uncertain discharge records. The primary analysis begins 24 hours after intensive care unit (ICU) admission and compares the Oxford Acute Severity of Illness Score (OASIS) with OASIS plus FI-Lab among patients with at least 15 observed items.

Cohort eligibility and outcome

MIMIC-IV eligibility selects the first recorded ICU stay per patient by admission time and stay identifier before restricting to surgical or trauma-surgical units. Patients must be at least 18 years old, have an ICU stay of at least four hours, and have a recorded hospital mortality flag. Age is derived from anchor age and year. The source cohort contains 16,890 patients. Landmark eligibility requires recorded hospital discharge strictly after ICU admission plus 24 hours and no recorded hospital death at or before that time. Records with missing death times are retained when continued hospitalization is recorded; ICU exit after the landmark was also verified in these records.

eICU eligibility requires a surgical ICU, the first unit stay within hospitalization, hospital status recorded as alive or expired, and age at least 18. Ages recorded as above 89 are represented as 90. One eligible hospitalization per patient is retained using the lowest unit-stay identifier, because absolute dates are unavailable to order separate hospitalizations. No four-hour ICU minimum is imposed. The source cohort contains 9,124 patients at 17 hospitals. Recorded hospital discharge more than 1,440 minutes after ICU admission defines landmark eligibility, and final hospital status defines mortality. The discharge offset is a proxy for survival through 24 hours because eICU lacks a separate death timestamp.

Each database contributes one observation per patient. Inclusion is based on ICU type rather than a confirmed operation; dedicated cardiac-surgical units are excluded. Hospitals are not identified and records are not linked across databases. Table S9 gives sequential cohort counts.

Measurement windows and accepted records

MIMIC laboratory values are linked by hospitalization and vital signs by ICU stay. The earliest charted value in the inclusive interval from ICU admission through 24 hours is retained for each item. eICU uses the earliest laboratory-result or observation offset from 0 through 1,440 minutes. Ties follow source-row order. Measurements are not additionally censored at ICU exit when the linked source supports continued hospital observation. These timestamps describe recorded measurements rather than confirmed bedside result availability.

Blood pressure uses the earliest accepted invasive or noninvasive value. At equal eICU offsets, the invasive source is retained because it is processed first and replaced only by a strictly earlier noninvasive value. eICU laboratory mappings distinguish total from ionized calcium and troponin T from troponin I. FI-Lab blood-gas items use the specified test identifiers or labels without a uniform

arterial-specimen restriction. Separate severity extraction applies arterial-specimen and oxygen-pairing rules where required. Table S8 lists the FI-Lab source identifiers.

Acceptance filters precede classification of an accepted value as normal or abnormal. eICU retains heart rate strictly between 0 and 300 beats/min, systolic pressure between 0 and 400 mmHg, and diastolic pressure between 0 and 300 mmHg. Severity extraction also restricts mean arterial pressure to 0–300 mmHg and respiratory rate to 0–70/min, excluding both endpoints. Periodic temperatures of 25–45 °C are accepted; values of 90–113 are interpreted as Fahrenheit and converted to Celsius. Nursing temperatures require 25–46 °C and Glasgow Coma Scale values require 3–15, with endpoints included. MIMIC-IV FI-Lab accepts parseable numeric values without the same vital-sign plausibility filters. An absent item can reflect testing practices, data capture, or rejected values; recorded availability does not distinguish these causes.

FI-Lab construction and availability

The 27-item FI-Lab comprises 24 laboratory items and three vital signs. The adaptation omits six urine items from the source ICU implementation: white and red blood cells, protein, ketones, glucose, and bilirubin. Requiring 15 observed items carries forward an absolute allowance of 12 missing items after these omissions. This is the study's calculability rule; component lists and minimum requirements differ across FI-Lab implementations.

For each patient, FI-Lab equals the number of abnormal observed items divided by the number observed, yielding a value from 0 to 1. Unobserved results are excluded from the primary denominator. Table S1 gives the applied abnormality thresholds, and Table S2 gives item-level observation and abnormality percentages. Recorded female/male sex determines the hemoglobin range; gender identity was unavailable. For unknown sex in eICU, the implemented hemoglobin range is 12–16 g/dL. Creatinine uses 0.4–1.1 mg/dL for all sexes, adapting the source publication's clinically implausible printed male range of 3.5–5.2 mg/dL.

Availability comparisons use all landmark-eligible patients. Standardized differences compare calculable and noncalculable groups using the pooled standard deviation; binary-variable variances are $p(1-p)$. Hospital-specific availability is reported only for hospitals with at least 50 eligible patients. Table S11 reports standardized differences. Counts and complementary statistics that could disclose groups of 1–10 patients are suppressed throughout the combined release.

Severity comparators

OASIS uses age, time in hospital before ICU admission, Glasgow Coma Scale, heart rate, mean arterial pressure, respiratory rate, temperature, urine output, ventilation, and elective surgery. MIMIC extraction follows the study's adaptation of published scoring code, including the six pre-ICU hours for applicable measurements and a stay-window ventilation flag. Missing component values contribute zero points.

In eICU, primary Glasgow Coma Scale values come from physical-examination and nursing tables. Urine output uses a versioned allowlist of intake/output labels with positive APACHE urine as fallback. Primary ventilation uses available APACHE ventilation fields. Elective surgery comes from the APACHE prediction table, with missing status contributing zero points. The complete derived

ventilation-events table referenced by an upstream query is unavailable in the distributed eICU data. Four alternative mappings vary urine-output sources, expanded available ventilation sources, and APACHE neurological components (Table S7). Table S10 reports missing source values before zero-point handling.

The supplied APACHE IVa hospital-mortality probability comes from the eICU APACHE results table for version IVa, accepting probabilities between zero and one. The common comparison cohort contains 4,823 patients with FI-Lab and APACHE IVa available, including 449 deaths at 17 hospitals. Five groups are formed by hospital; each is evaluated using models fitted to the other four, so a hospital never contributes patients to both fitting and evaluation in a fold. The APACHE baseline recalibrates the supplied probability's log odds with a logistic intercept and slope. FI-Lab is added using training-data standardization. OASIS models use the same patient groups. The supplied, unmodified APACHE IVa probability remains a separate benchmark. These locally fitted comparisons are distinct from applying MIMIC-IV equations unchanged in eICU.

Model fitting and prediction equations

Primary development uses stratified 10-fold cross-validation in MIMIC-IV, with standardization estimated only within each training fold. Each patient receives a prediction from a model fitted without that patient's fold. Final models fitted to the full development cohort supply coefficients and standardization constants for unchanged application in eICU. Predictors enter as linear terms with an intercept; convergence was checked, without tuning or outcome-guided component selection. The base random seed is 20260812; derived fold and resampling seeds are specified in the analysis code.

For each predictor, $z=(\text{value}-\text{training mean})/\text{training standard deviation}$. Predicted mortality is $p=1/(1+\exp(-\eta))$, where η is the intercept plus the sum of the standardized predictors multiplied by their coefficients. The tables below give full-development means, population standard deviations, and fitted coefficients. Displayed values are rounded; the accompanying machine-readable equations retain computational precision.

Predictor	Mean	Population standard deviation
FI-Lab	0.425511658	0.155175067
Observed FI-Lab component count	19.756101083	3.279584695
OASIS	31.120505415	8.513704715

Model	Intercept	OASIS coefficient	FI-Lab coefficient	Observed-count coefficient
FI-Lab	-2.419327179	0.000000000	0.693130260	0.000000000
OASIS	-2.618711231	0.997632649	0.000000000	0.000000000
OASIS + FI-Lab	-2.676703019	0.870398734	0.399927523	0.000000000
OASIS + FI-Lab + observed-item count	-2.691363938	0.818353497	0.322990823	0.213042457
OASIS + observed-item count	-2.659025363	0.883504314	0.000000000	0.320628798

All eligible records in the database versions were used, without a recruitment target or formal sample-size calculation. The largest primary model has three predictor coefficients plus an intercept, with 1,341 development deaths and 497 external-evaluation deaths. External evaluation includes 17 hospitals. Structured fields supply predictors and outcomes; scoring code does not receive outcome as an input. No new subjective or blinded clinical assessment was performed. Patients and the public were not involved in study design or conduct. Outcome prevalence was not changed by weighting or class rebalancing; demographic subgroup performance and fairness optimization were not evaluated.

Predictions describe prognosis under observed care. Treatment exposures are not separate predictors, although ventilation contributes to OASIS and first-day measurements may reflect interventions. Interpretation as baseline vulnerability and transfer to settings with different treatment practices therefore require caution.

Performance and uncertainty

Discrimination is measured by the area under the receiver operating characteristic curve (AUROC). The Brier score is the mean squared difference between predicted probability and outcome. Calibration-in-the-large is the intercept from a logistic model with prediction log odds as an offset and slope fixed to one. Calibration slope comes from a separate logistic model with a free intercept and slope. Their targets are zero and one, respectively. For calibration plots, predictions are divided into deciles and adjacent groups are combined until event and nonevent counts each reach at least 11; a terminal remainder joins the preceding group.

Primary 95% confidence intervals use 2,000 paired patient-bootstrap draws in MIMIC-IV and 2,000 paired hospital-bootstrap draws in eICU. The same sampled units are used for each model in a comparison. Hospital draws retain all patients in the sampled hospitals, including repeated draws. Percentile intervals use the 2.5th and 97.5th percentiles. Resampling conditions on fixed prediction vectors and does not refit development models, so it omits part of model-development uncertainty. The common eICU comparator analysis uses seed 20260718 for its five hospital groups and 2,000 common hospital draws.

The primary contrast is the AUROC change after adding FI-Lab to OASIS. Brier changes and calibration provide complementary assessments. Observed-count models and the APACHE comparison provide supporting evidence without multiplicity-adjusted significance claims. Sensitivities examine stricter observation requirements, a fixed denominator, full source-cohort inclusion, alternative OASIS sources, and conflicting discharge records. Their methods and descriptive estimates accompany Tables S6, S7, and S12.

Analytic origin and scope

The original protocol was finalized on 9 July 2026 before initial analyses and was not publicly registered. July amendments followed initial results, separated first-day prediction from diagnosis-based analyses using final hospitalization codes, and specified an APACHE analysis after earlier external evaluation. A 12 July update followed input reconstructions and review of one severity-adjusted FI-Lab analysis. The present focus on score availability, observed-item count, and the primary

landmark question developed in August after earlier results and clinical feedback; OASIS was selected after earlier comparisons of severity scores.

The September amendment corrected the MIMIC hospitalization criterion and specified the OASIS/APACHE comparison in the same patients before it was run. The later discharge-consistency analysis was specified after the main results and manuscript were available, before its estimates were computed. Diagnosis-derived frailty scores, diagnosis-documentation horizons, length of stay, and discharge disposition were omitted from this focused paper after review of the broader study's results. Thus, held-out prediction assesses model performance but does not make the selection of this research question independent of earlier results.

Supporting tables

Table S1. FI-Lab components and applied thresholds

Item	Unit	Abnormal result
Systolic blood pressure	mmHg	<90 or >140
Diastolic blood pressure	mmHg	<60 or >90
Heart rate	per minute	<60 or >99
White blood cell count	10^9/L	<4 or >11
Platelet count	10^9/L	<140 or >440
Hemoglobin (female)	g/dL	<12 or >16
Hemoglobin (male)	g/dL	<14 or >18
Total bilirubin	mg/dL	>1.5
Alanine aminotransferase	U/L	>40
Albumin	g/dL	<3.5 or >5
Alkaline phosphatase	U/L	<35 or >105
Lactate dehydrogenase	U/L	<94 or >250
Blood urea nitrogen	mg/dL	<6 or >20
Creatinine	mg/dL	<0.4 or >1.1
Glucose	mg/dL	<70 or >110
Potassium	mmol/L	<3.5 or >5.4
Sodium	mmol/L	<133 or >145
Calcium	mg/dL	<8.4 or >10.3
Phosphorus	mg/dL	<2.7 or >4.5
Prothrombin time	s	<9.4 or >12.5
International normalized ratio	/	<0.9 or >1.1
Partial thromboplastin time	s	<25 or >35
Fibrinogen	mg/dL	<150 or >400
Troponin T	ug/L	>0.01
pH	/	<7.35 or >7.45
Partial pressure of oxygen	mmHg	<85 or >105
Partial pressure of carbon dioxide	mmHg	<35 or >45
Lactate	mmol/L	<0.5 or >2

Values at the stated boundaries are non-deficits. Hemoglobin has two sex-specific rows but is one of the 27 items. The creatinine and unknown-sex hemoglobin adaptations are described above. Threshold ancestry: Shen et al., European Journal of Medical Research 2026;31:134, doi:10.1186/s40001-025-03736-4, and its supplementary threshold table.

Table S2. Item availability and abnormality at the 24-hour landmark

Item	MIMIC-IV observed, %	MIMIC-IV abnormal if observed, %	eICU observed, %	eICU abnormal if observed, %
Systolic blood pressure	99.5	36.5	96.2	38.3
Diastolic blood pressure	99.5	37.2	96.2	42.0
Heart rate	99.8	30.4	96.3	32.6
White blood cell count	97.1	51.9	88.9	52.4
Platelet count	97.1	21.8	86.8	25.6
Hemoglobin	97.1	78.8	90.4	81.6
Total bilirubin	34.0	25.6	30.6	17.9
Alanine aminotransferase	35.2	39.7	34.0	30.4
Albumin	25.0	61.3	42.7	74.5
Alkaline phosphatase	34.6	28.9	33.5	27.2
Lactate dehydrogenase	16.3	54.5	1.8	62.7
Blood urea nitrogen	97.4	34.6	90.6	39.3
Creatinine	97.5	26.5	90.9	38.7
Glucose	97.4	73.9	90.6	73.0
Potassium	97.6	15.8	91.1	15.9
Sodium	97.5	10.9	90.9	12.6
Calcium	96.1	47.9	88.2	53.9
Phosphorus	96.0	33.2	54.3	35.3
Prothrombin time	76.3	64.0	38.5	68.0
International normalized ratio	76.3	58.5	38.5	64.9
Partial thromboplastin time	75.4	37.2	28.3	45.5
Fibrinogen	14.0	41.7	5.9	41.2
Troponin T	11.3	89.8	1.7	92.7
pH	50.5	53.2	32.9	55.2
Partial pressure of oxygen	48.6	87.9	35.9	83.7
Partial pressure of carbon dioxide	48.6	50.1	36.0	52.9
Lactate	44.2	44.0	23.8	41.9

Observation percentages use all landmark-eligible patients; abnormality percentages use patients in whom the item was observed. The distributions describe which measurements contribute to FI-Lab in each database.

Table S3. Complete primary model performance

Database	Model	Measure	Estimate (95% CI)
MIMIC-IV	OASIS	AUROC	0.7695 (0.7573 to 0.7821)
MIMIC-IV	OASIS	Brier	0.07904 (0.07566 to 0.08261)
MIMIC-IV	OASIS	Calibration-in-the-large	0.000 (-0.059 to 0.060)
MIMIC-IV	OASIS	Calibration slope	0.998 (0.943 to 1.062)
MIMIC-IV	FI-Lab	AUROC	0.6829 (0.6676 to 0.6979)
MIMIC-IV	FI-Lab	Brier	0.08371 (0.08008 to 0.08746)
MIMIC-IV	FI-Lab	Calibration-in-the-large	-0.000 (-0.059 to 0.057)
MIMIC-IV	FI-Lab	Calibration slope	0.998 (0.913 to 1.089)
MIMIC-IV	OASIS + FI-Lab	AUROC	0.7828 (0.7709 to 0.7955)
MIMIC-IV	OASIS + FI-Lab	Brier	0.07795 (0.07459 to 0.08148)
MIMIC-IV	OASIS + FI-Lab	Calibration-in-the-large	-0.000 (-0.061 to 0.061)
MIMIC-IV	OASIS + FI-Lab	Calibration slope	0.998 (0.944 to 1.057)
MIMIC-IV	OASIS + observed-item count	AUROC	0.7793 (0.7675 to 0.7916)
MIMIC-IV	OASIS + observed-item count	Brier	0.07826 (0.07492 to 0.08176)
MIMIC-IV	OASIS + observed-item count	Calibration-in-the-large	-0.000 (-0.060 to 0.060)
MIMIC-IV	OASIS + observed-item count	Calibration slope	0.998 (0.945 to 1.056)
MIMIC-IV	OASIS + FI-Lab + observed-item count	AUROC	0.7862 (0.7745 to 0.7984)
MIMIC-IV	OASIS + FI-Lab + observed-item count	Brier	0.07763 (0.07429 to 0.08104)
MIMIC-IV	OASIS + FI-Lab + observed-item count	Calibration-in-the-large	-0.000 (-0.060 to 0.060)
MIMIC-IV	OASIS + FI-Lab + observed-item count	Calibration slope	0.997 (0.946 to 1.056)
eICU	OASIS	AUROC	0.7436 (0.7052 to 0.7702)
eICU	OASIS	Brier	0.07896 (0.06294 to 0.09529)
eICU	OASIS	Calibration-in-the-large	0.353 (0.042 to 0.631)
eICU	OASIS	Calibration slope	0.791 (0.676 to 0.869)
eICU	FI-Lab	AUROC	0.7044 (0.6776 to 0.7405)
eICU	FI-Lab	Brier	0.08193 (0.06498 to 0.09811)
eICU	FI-Lab	Calibration-in-the-large	-0.169 (-0.493 to 0.092)
eICU	FI-Lab	Calibration slope	1.132 (0.946 to 1.383)
eICU	OASIS + FI-Lab	AUROC	0.7745 (0.7492 to 0.7926)
eICU	OASIS + FI-Lab	Brier	0.07683 (0.06092 to 0.09264)

Database	Model	Measure	Estimate (95% CI)
eICU	OASIS + FI-Lab	Calibration-in-the-large	0.243 (-0.069 to 0.503)
eICU	OASIS + FI-Lab	Calibration slope	0.895 (0.819 to 0.973)
eICU	OASIS + observed-item count	AUROC	0.7536 (0.7144 to 0.7810)
eICU	OASIS + observed-item count	Brier	0.07831 (0.06202 to 0.09527)
eICU	OASIS + observed-item count	Calibration-in-the-large	0.476 (0.170 to 0.760)
eICU	OASIS + observed-item count	Calibration slope	0.837 (0.721 to 0.931)
eICU	OASIS + FI-Lab + observed-item count	AUROC	0.7765 (0.7488 to 0.7966)
eICU	OASIS + FI-Lab + observed-item count	Brier	0.07664 (0.06040 to 0.09296)
eICU	OASIS + FI-Lab + observed-item count	Calibration-in-the-large	0.350 (0.051 to 0.612)
eICU	OASIS + FI-Lab + observed-item count	Calibration slope	0.919 (0.831 to 1.009)

MIMIC-IV estimates use out-of-fold predictions; eICU estimates use the final MIMIC-IV models without updating. AUROC, area under the receiver operating characteristic curve; CI, confidence interval. Calibration-in-the-large targets zero and calibration slope targets one; lower Brier scores indicate less prediction error.

Table S4. Paired increments for the primary and observed-count comparisons

Database	Addition	AUROC change (95% CI)	Brier change (95% CI)
MIMIC-IV	FI-Lab added to OASIS	0.0132 (0.0081 to 0.0184)	-0.00110 (-0.00157 to -0.00061)
MIMIC-IV	Observed-item count added to OASIS	0.0098 (0.0055 to 0.0140)	-0.00078 (-0.00119 to -0.00039)
MIMIC-IV	FI-Lab added to OASIS and observed-item count	0.0069 (0.0030 to 0.0107)	-0.00063 (-0.00099 to -0.00026)
MIMIC-IV	Observed-item count added to OASIS and FI-Lab	0.0034 (0.0009 to 0.0061)	-0.00032 (-0.00056 to -0.00008)
eICU	FI-Lab added to OASIS	0.0309 (0.0180 to 0.0471)	-0.00213 (-0.00345 to -0.00112)
eICU	Observed-item count added to OASIS	0.0099 (0.0057 to 0.0161)	-0.00065 (-0.00127 to 0.00009)
eICU	FI-Lab added to OASIS and observed-item count	0.0230 (0.0124 to 0.0356)	-0.00167 (-0.00285 to -0.00076)
eICU	Observed-item count added to OASIS and FI-Lab	0.0020 (-0.0021 to 0.0058)	-0.00019 (-0.00077 to 0.00054)

Positive AUROC changes and negative Brier changes favor the extended model. Observed-count comparisons assess additional prognostic information after including measurement count; they do not remove all selection related to the observation process.

Table S5. Severity-comparator analysis in the same eICU patients

Model	AUROC (95% CI)	Brier (95% CI)	Calibration-in-the-large	Calibration slope
OASIS	0.7387 (0.7039 to 0.7671)	0.07727 (0.06051 to 0.09449)	-0.001	0.969
OASIS + FI-Lab	0.7718 (0.7561 to 0.7914)	0.07547 (0.05857 to 0.09275)	0.000	0.952
Supplied APACHE IVa probability (unmodified)	0.8438 (0.8169 to 0.8610)	0.06879 (0.05793 to 0.07926)	-0.438	0.949
Recalibrated APACHE IVa	0.8434 (0.8170 to 0.8607)	0.06710 (0.05543 to 0.07829)	0.006	0.996
APACHE IVa + FI-Lab	0.8509 (0.8255 to 0.8656)	0.06713 (0.05480 to 0.07887)	0.017	0.988

All rows use 4,823 patients with 449 deaths at 17 hospitals. Except for the supplied unmodified APACHE IVa probability, estimates use hospital-grouped held-out predictions from models fitted in eICU. Applying MIMIC equations unchanged to this subset is reported separately in the accompanying aggregate results.

Adding FI-Lab increased AUROC by 0.0331 (95% CI 0.0069 to 0.0637) beyond OASIS and by 0.0075 (0.0028 to 0.0131) beyond recalibrated APACHE IVa. The difference between increments was 0.0256 (0.0025 to 0.0537). The APACHE-based Brier change was 0.00003 (-0.00129 to 0.00153).

Table S6. Observation-rule and full-cohort sensitivity analyses

Analysis	Database	Patients	Deaths	AUROC change	Brier change
At least 20/27 observed; landmark	MIMIC-IV	7,406	1,005	0.0135	-0.00149
At least 20/27 observed; landmark	eICU	1,709	270	0.0363	-0.00357
Deficits divided by 27; landmark	MIMIC-IV	16,101	1,425	0.0140	-0.00110
Deficits divided by 27; landmark	eICU	8,631	610	0.0233	-0.00153
At least 15/27 observed; full source cohort	MIMIC-IV	14,310	1,592	0.0143	-0.00213
At least 15/27 observed; full source cohort	eICU	5,405	596	0.0361	-0.00371

Each sensitivity fits the specified MIMIC models and applies its own equations unchanged to eICU. The stricter observation rule examines performance among patients with more complete measurements. The fixed denominator divides observed deficits by 27, treating unobserved items as

non-abnormal. Full source-cohort inclusion permits deaths and discharges during the first-day measurement window and therefore changes the prediction question. Confidence intervals were not calculated for these descriptive estimates.

Table S7. OASIS source-mapping sensitivities in eICU

Source mapping	OASIS AUROC	OASIS + FI-Lab AUROC	AUROC change
Primary reference-informed	0.7436	0.7745	0.0309
Broader urine-output mapping	0.7503	0.7795	0.0292
Expanded available ventilation sources	0.7352	0.7663	0.0311
APACHE neurological components; reference urine	0.7522	0.7806	0.0284
APACHE neurological components; broader urine	0.7588	0.7855	0.0267

All variants use 5,226 patients, 497 hospital deaths, and unchanged MIMIC coefficients and standardization. These descriptive estimates assess dependence on available extraction sources; the unavailable complete ventilation-events table is not reconstructed.

Table S8. Database source identifiers for FI-Lab

Item	MIMIC-IV identifiers	eICU source
Systolic blood pressure	220050, 220179	vitalPeriodic.systemicsystolic; vitalAperiodic.noninvasivesystolic
Diastolic blood pressure	220051, 220180	vitalPeriodic.systemicdiastolic; vitalAperiodic.noninvasivediastolic
Heart rate	220045	vitalPeriodic.heartrate
White blood cell count	51301	WBC x 1000
Platelet count	51265	platelets x 1000
Hemoglobin	51222	Hgb
Total bilirubin	50885	total bilirubin
Alanine aminotransferase	50861	ALT (SGPT)
Albumin	50862	albumin
Alkaline phosphatase	50863	alkaline phos.
Lactate dehydrogenase	50954	LDH
Blood urea nitrogen	51006	BUN
Creatinine	50912	creatinine
Glucose	50931	glucose
Potassium	50971	potassium
Sodium	50983	sodium
Calcium	50893	calcium
Phosphorus	50970	phosphate
Prothrombin time	51274	PT
International normalized ratio	51237	PT - INR
Partial thromboplastin time	51275	PTT
Fibrinogen	51214	fibrinogen
Troponin T	51003	troponin - T
pH	50820	pH
Partial pressure of oxygen	50821	paO2
Partial pressure of carbon dioxide	50818	paCO2
Lactate	50813	lactate

MIMIC-IV identifiers refer to labevents for laboratories and chartevents for vital signs. eICU entries give laboratory-table labels or vital-sign table and column names. These extraction identifiers contain no patient identifiers. Measurement windows, tie rules, and acceptance filters are specified in Additional methods.

Table S9. Participant flow

Database	Inclusion stage	Number retained
MIMIC-IV	All recorded ICU stays	94,458
MIMIC-IV	First recorded ICU stay per patient	65,366
MIMIC-IV	First stay in surgical or trauma-surgical ICU	16,982
MIMIC-IV	Adult, measurable ICU stay of at least four hours, known outcome and age	16,890
MIMIC-IV	Hospitalized beyond the 24-hour landmark	16,101
MIMIC-IV	At least 15 observed FI-Lab items at the landmark	13,850
eICU	All surgical ICU unit stays	12,181
eICU	First unit stay in hospitalization	9,862
eICU	Known hospital outcome	9,808
eICU	Adult	9,770
eICU	One eligible hospitalization per patient	9,124
eICU	Recorded hospital discharge more than 24 hours after ICU admission	8,631
eICU	At least 15 observed FI-Lab items at the landmark	5,226
eICU	APACHE IVa mortality probability supplied in eICU also available at the landmark	4,823

Counts are sequential within each database. MIMIC-IV measurable-length-of-stay and minimum-duration exclusions are combined to protect a small cell. APACHE IVa availability defines only the secondary common-cohort comparison.

Table S10. Missing OASIS inputs in the primary calculable-score cohorts

OASIS input	MIMIC-IV missing, n (%)	eICU missing, n (%)
Age	0 (0.00)	0 (0.00)
Hospital time before ICU admission	0 (0.00)	0 (0.00)
Glasgow Coma Scale	24 (0.17)	1,367 (26.16)
Heart rate	20 (0.14)	72 (1.38)
Mean arterial pressure	21 (0.15)	75 (1.44)
Respiratory rate	23 (0.17)	465 (8.90)
Temperature	59 (0.43)	Suppressed
Urine output	195 (1.41)	1,274 (24.38)
Elective surgery status	0 (0.00)	3,082 (58.97)

Denominators are 13,850 in MIMIC-IV and 5,226 in eICU. Missingness refers to absence of the source value before zero-point handling. Ventilation is a derived yes/no indicator, whose completeness cannot be inferred from absence of nulls. eICU physiological coverage uses stored source-coverage flags. A suppressed cell and its percentage are withheld together to protect a group of 1–10 patients.

Table S11. Standardized differences between patients with and without calculable FI-Lab

Characteristic	MIMIC-IV standardized difference	eICU standardized difference
Age	0.061	-0.013
Recorded female	-0.026	Suppressed
OASIS	0.597	0.665
Hospital mortality	0.240	0.255
Observed FI-Lab component count	2.422	2.232

Positive values indicate higher values or proportions in patients with calculable scores. The pooled-standard-deviation calculation is described in Additional methods. The eICU recorded-sex comparison is suppressed to protect the small unknown-sex category.

Table S12. eICU discharge-consistency sensitivity

This analysis excludes records with an expired unit discharge at or before 1,440 minutes, or an expired unit status with an alive hospital outcome. The existing MIMIC equations are applied unchanged, without refitting or additional resampling. Conflicting sources cannot determine the true death status or timing, so the primary hospital-outcome definition is retained. Analysis and exclusion counts are withheld to prevent disclosure of a small subgroup.

Model	Measure	Primary analysis	After exclusion
OASIS	AUROC	0.744	0.743
OASIS	Calibration-in-the-large	0.35	0.35
OASIS	Calibration slope	0.79	0.79
OASIS	Brier score	0.0790	0.0789
OASIS + FI-Lab	AUROC	0.775	0.774
OASIS + FI-Lab	Calibration-in-the-large	0.24	0.24
OASIS + FI-Lab	Calibration slope	0.90	0.89
OASIS + FI-Lab	Brier score	0.0768	0.0768

The AUROC increment after exclusion was 0.031 and the Brier change was -0.0021. These rounded point estimates describe sensitivity to uncertain source records; confidence intervals were not computed. Analytic timing is reported in Additional methods.

Observed hospital endpoint window

In the original prediction cohorts, the median interval from the 24-hour landmark to recorded hospital discharge was 6.1 days (interquartile range 3.2–12.0) in MIMIC-IV and 5.9 days (3.2–10.8) in eICU. This later descriptive summary characterizes the observed endpoint window rather than a modeled length-of-stay outcome.

Reproducibility and data access

The accompanying package contains source extraction and scoring code, the common threshold specification, full-precision model equations, analysis code, dependency versions, seeds, and disclosure-screened aggregate results. Source databases are read without modification. Database, code, and output hashes support computational traceability. Individual predictions and patient records are excluded. Access to the original databases requires separate PhysioNet credentialing, training, and data-use agreements.