SANOME

User Manual

MEMORI
infection risk predictor

MEMORI device & accessory version:
20250929_infection-risk-predictor
20250929_user-helper
20250929_model-helper
20250929_ehr-connector

Electronic Health Record: PatientSource

User Manual v4.1 | Effective from 29th September 2025

Electronic IFU

Intended Use

MEMORI is a modular software as a medical device (SaMD) which may utilize compatible software to obtain patient data collated from Electronic Health Record systems (EHR) and deliver a risk score (Memori Risk Score) to inform clinical management through the use of a proprietary Machine Learning model to categorise and stratify the risk of patients developing hospital acquired infections (HAIs) and predicting a set time frame of onset in the patient population. The MEMORI score and the information displayed on the explanatory dashboard can be used by a clinician to inform the management of a patient. Potential next actions may be displayed based on national guidelines and/or local policies as appropriate.

MEMORI is intended for use by trained healthcare professionals, including doctors, nurses, and healthcare assistants, for adult patients aged over 18 and under 90 years with acute neurological injuries and/or neurological conditions.

It is to be used within secondary care settings, including but not limited to:

- Acute brain injury wards
- Stroke units
- Complex neuro-rehabilitation units
- Prolonged Disorders of Consciousness (PDOC) units
- Ventilation and complex respiratory wards
- Neuro-behavioural wards
- Neurosurgical intensive care units (Neuro SICU)
- Intermediate neurological wards
- Neurological stepdown units

Use is restricted to the specified patient population and the defined clinical environments such as the above.

MEMORI is viewed on the care facility IT system through the EHR provider. Data from patients entered in the EHR both physiological and non-physiological, is processed by the Memori algorithm and the generated risk score is displayed to the clinicians via the EHR or Memori explainability dashboard. As patient data is updated with more monitoring inputs, so the risk score is updated and displayed. If the MEMORI score falls within a predetermined threshold, an alert message appears to inform the clinician regarding the change in metrics and MEMORI score. On the alert message, the clinician will also be able to access the explainability dashboard where they will be able to visualise patient-information including, but not limited to, vital sign trends, MEMORI score trend, recent investigations, drug history.

MEMORI is designed to predict the onset of HAIs and subsequently **INFORM** the clinician of this, to allow them to consider further investigations. This timely detection will translate into a clinician considering an appropriate intervention thereby significantly reducing the risk of complications and shortening the extra length of stay usually associated with the development of HAIs. Memori is **NOT** intended to replace clinicians or multi-disciplinary team members, drive clinical management, be used in replacement of new observations, investigations or treatment decisions, be used as the sole driver for discharge of patients from the hospital or to replace local or national guidelines.

Excluded use

MEMORI should NOT be used:

- In replacement of a clinician or multi-disciplinary team member
- To drive clinical management of patients
- In replacement of new observations, investigations, or treatment decisions
- Driver for discharge of patients from the hospital
- To replace local or national guidelines

Safety & precautions

MEMORI should never replace a healthcare professional's clinical judgement. The MEMORI risk level should always be used considering other relevant clinical observations and contextual information about the patient.

MEMORI risk level

The output of the device is a risk level called the **MEMORI risk level**. This risk level is generated in real time from the patient information entered into the EHR.

The MEMORI risk level indicates the patient's likelihood of developing an infection in the next 0-7 days. The MEMORI risk level is updated when new observations are entered.

The risk level can take the following values: low, moderate, high or critical.

Low	The patient is very unlikely to develop an infection in the next 3 days
Moderate	The patient is unlikely to develop an infection in the next 3 days
High	The patient is likely to develop an infection in the next 3 days
Critical	The patient is very likely to be currently developing an infection

Explainability dashboard

The explainability dashboard can be used to understand the key factors behind the patient's MEMORI risk level and to view further context regarding the patient.

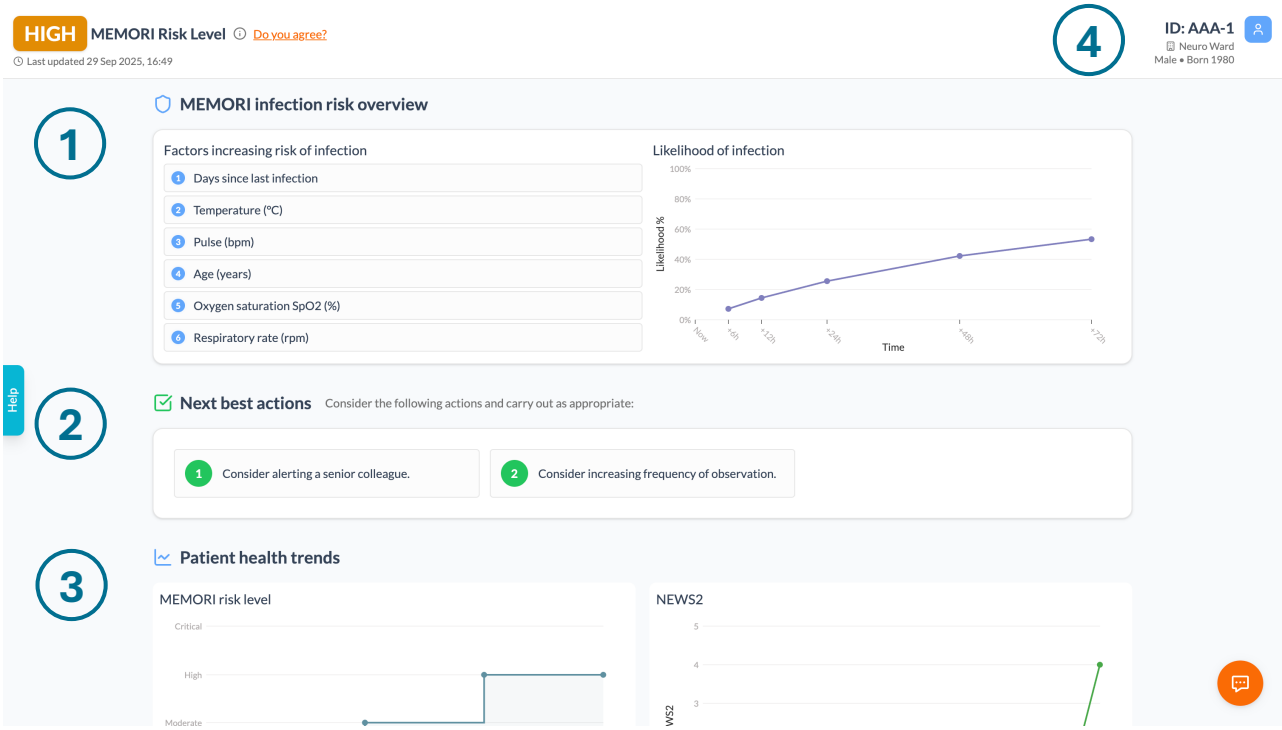
1. Information about the MEMORI risk score

2. Next best actions provided by your hospital or clinical team. The content displayed here is specific to your clinical setting.

3. Patient health trends displays up to 10 days of vital trends for the patient. This data comes directly from the electronic patient record.

4. Patient's local hospital ID and the ward they are currently admitted to.

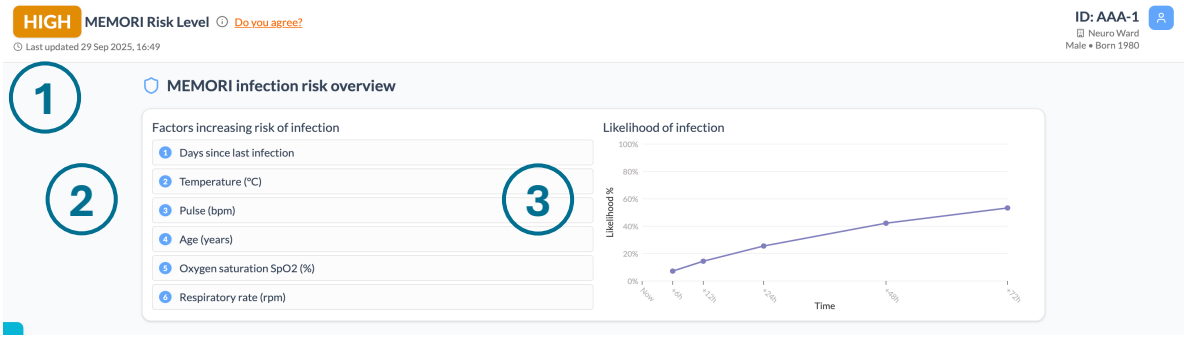
See the blue 'Help' tab on the left hand side to access the Electronic User Manual and Labels



1. MEMORI risk & explainability
2. Next best actions
3. Patient health trends
4. Patient ID & ward

Understanding the MEMORI risk level

The explainability dashboard displays the key factors behind a patient's MEMORI risk level for one patient at a time.



1. MEMORI risk level

This patient's current risk for infection and when the risk was last updated.

2. Factors increasing risk

This list shows the most important factors increasing this patient's risk of infection.

The list includes up to 10 items.

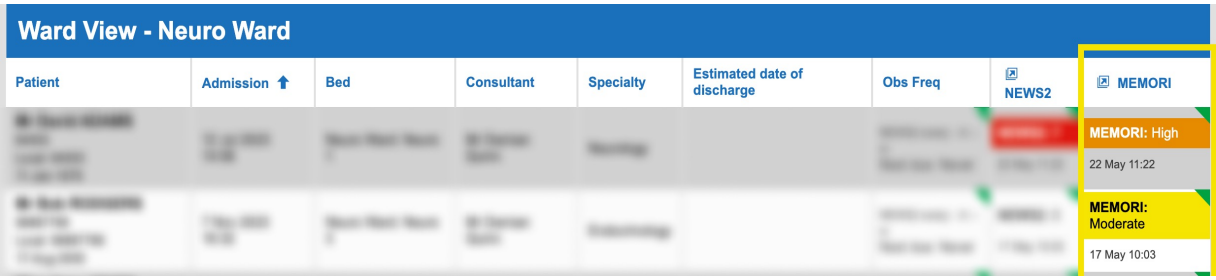
3. Likelihood of infection

This graph displays the likelihood of this patient developing an infection after 3 hours, 6 hours, 12 hours, 24 hours and three days as a percentage.

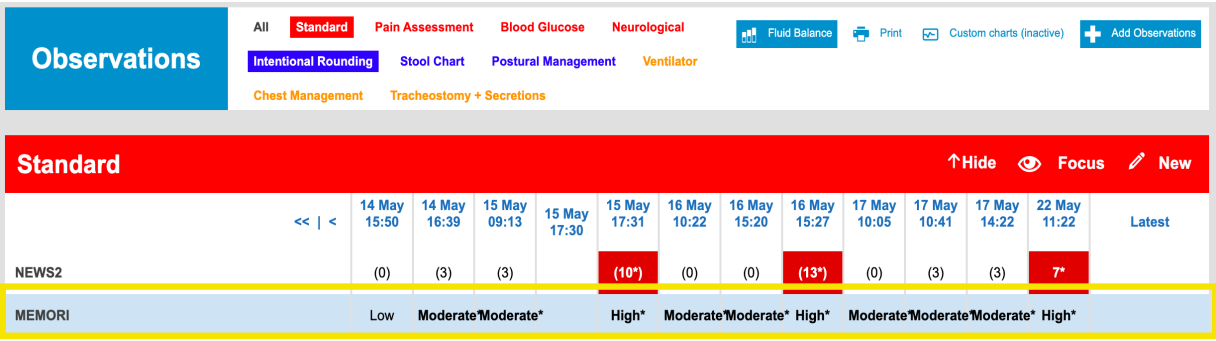
This likelihood is calculated by the MEMORI risk predictor and updates every time the patient's risk level updates.

How to view the MEMORI risk level

Patient's MEMORI risk level is visible in two locations within PatientSource: the Ward View and Observations view.



MEMORI risk level in the Ward view

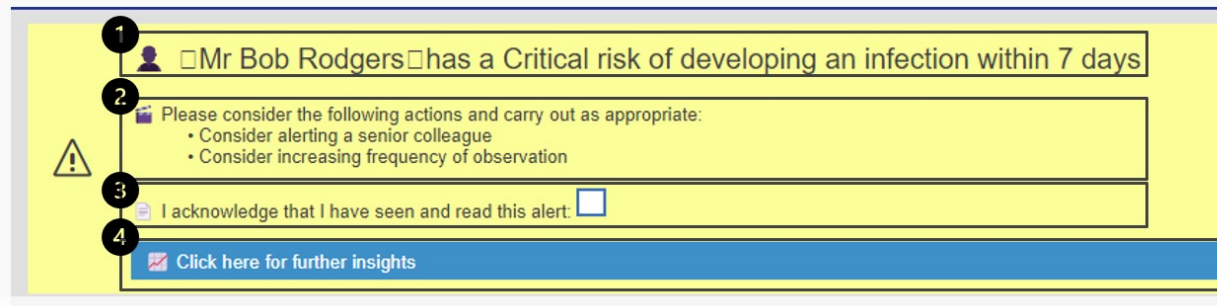


MEMORI risk level in the Observations view

MEMORI alert

When a patient's MEMORI risk level becomes "**High**" or **"Critical"** an alert will appear in the Observation view. The MEMORI alert includes the patient's MEMORI risk level and possible actions to consider.

The MEMORI alert will remain visible until it is acknowledged by clicking the checkbox in the alert.

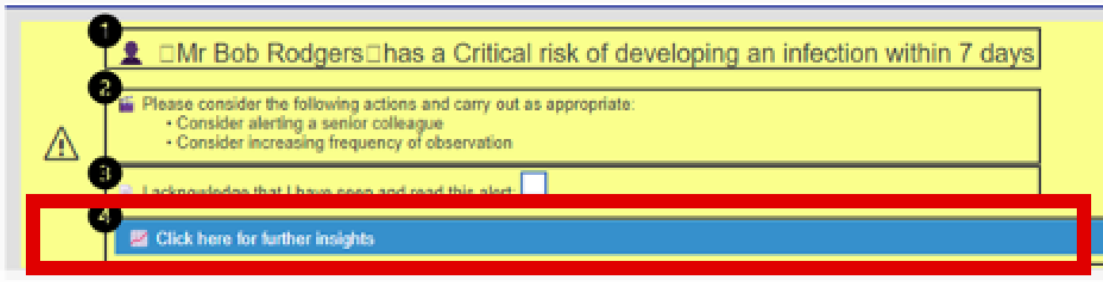


MEMORI alert

How to view the explainability dashboard

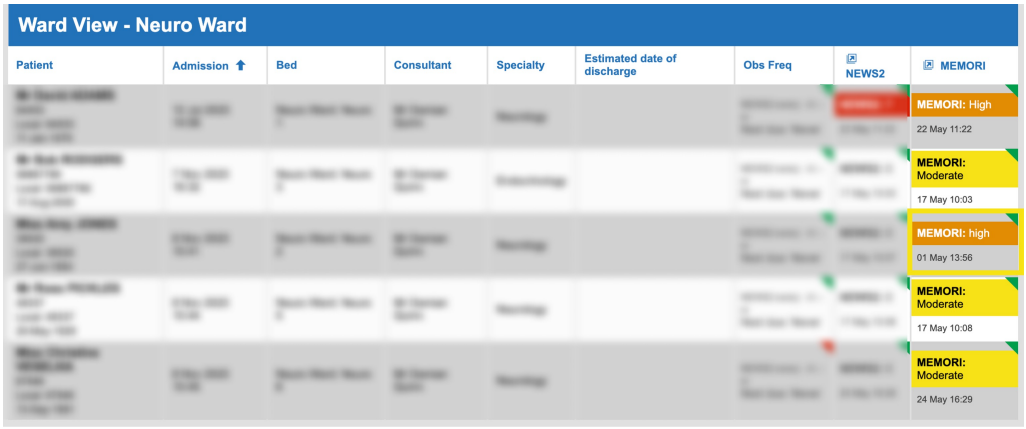
The explainability dashboard can be accessed two ways:

a) By clicking on the blue field "*Click here for further insights*" on a MEMORI alert



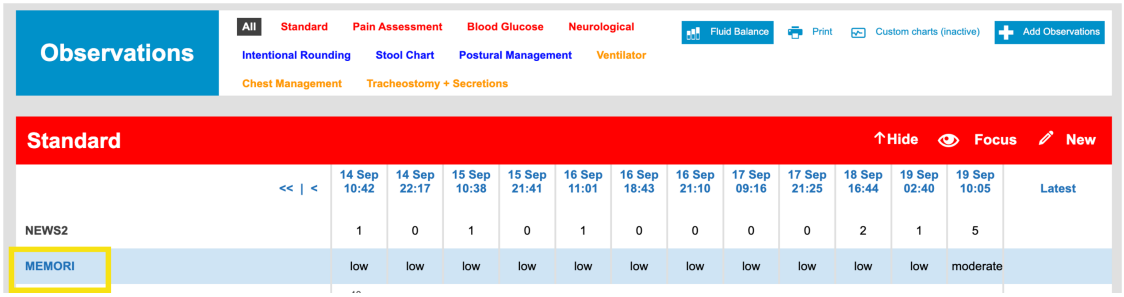
MEMORI alert with a link to the dashboard

b) Click on the MEMORI risk level on the ward board



Explainability dashboard link within ward board

c) Click on the MEMORI title in observations view



Explainability dashboard link within observations

Emergency & technical support

In case of device malfunction, please email support@sanome.com.

In case of an emergency outside of working hours, follow the standard escalation procedure for your hospital.

For a paper copy of this Manual, please email support@sanome.com

If a serious incident occurs in relation to the product, report should be made to the MHRA through the Yellow Card Scheme: https://yellowcard.mhra.gov.uk/

Performance & clinical benefit

The device produces an updated risk score in under 5 mins, from the time that additional observations are entered about a patient.

The intended clinical benefits are to offer clinical decision support to qualified healthcare professionals for the purpose of

- increasing the accuracy of the identification of patients at risk of developing an infection;
- alerting at-risk patients up to 7-days in advance of infection onset.

The intended clinical benefit of MEMORI (the device) is indirect rather than direct. Through demonstrating acceptable clinical performance, software validation, and summative usability, the indirect clinical benefit of “MEMORI” (the device) lies in the provision of accurate medical information on patients, as assessed by being more accurate in performing the task of “identifying patients at risk of developing an infection” to the generally accepted and established State of the Art. Providing such accurate medical information facilitates subsequent clinical assessment and management decisions for patients, made by the responsible clinician.

The clinical outcome parameter(s) to assess clinical benefit is prognostic accuracy, or reliability (timing), and precision of detecting nosocomial infections that require antibiotics up to 7 days from a measurement recording. The prognostic accuracy of detection is compared to current standard-of-care, NEWS2.

Device details

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WC1X 8HN

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EHR Connector

(11)2003874356
Model Helper

(11)2003868387
Infection Risk Predictor

(11)2003876612
User Helper

Symbols used

Consult Instructions for Use
Electronic IFU

Date of manufacture

Manufacturer

EC REP European representative

UDI Unique Device Identification

CE European Medical Device

MD Medical device

Supporting performance evidence

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Survival rates

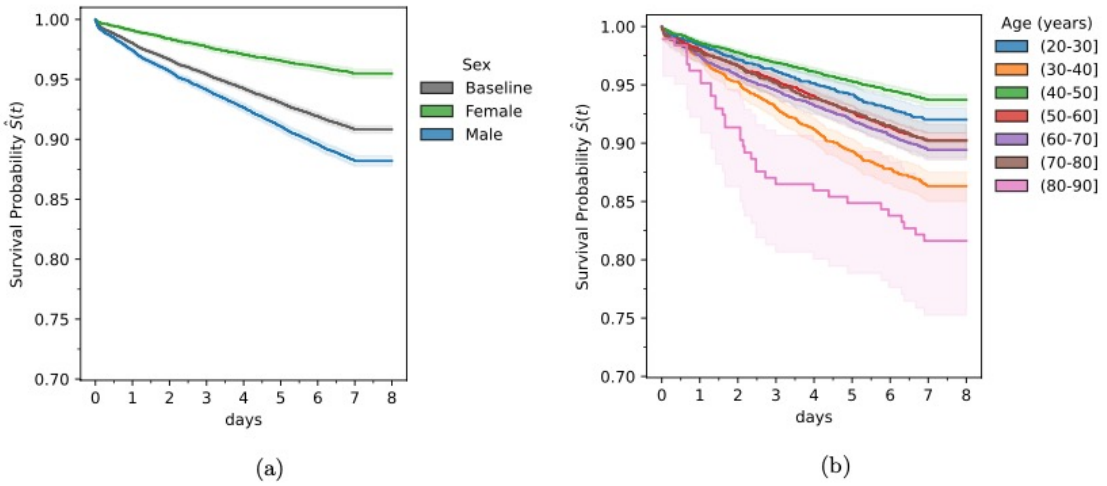


Figure 1: **Survival rates by demographic factors.** Empirically calculated Kaplan-Meier estimator of the survival functions by (a) sex and (b) 10-year age range groups. Baseline survival rates are calculated over the entire study population.

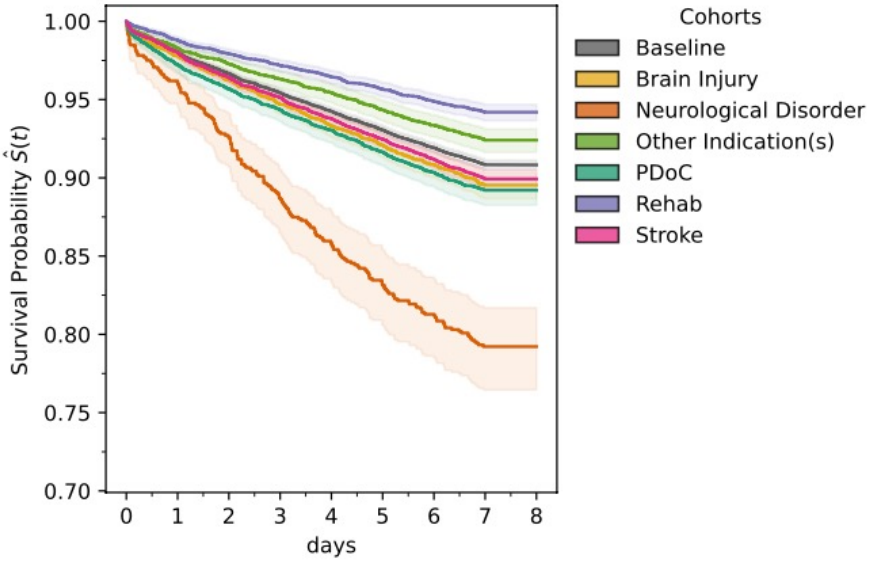


Figure 2: **Survival rates by comorbidity profile.** Empirically calculated Kaplan-Meier estimator of the survival functions for major comorbidity subgroups: brain injury, neurological disorders, other conditions, prolonged disorders of consciousness (PDoC), rehab, and stroke patients.

Summary of Population Characteristics

Table 1: **Summary of Population Characteristics**. The median + 95th centile of each characteristic are reported across the entire population, the historical in-sample training split, and the temporally held-out test split (silent-trial; new patients admitted after specified cut-off date), unless otherwise stated.

	population	historical training set	held-out testing set
Data Collection			
Timeline, year		2019–2022	2022–2023
period, weeks (%)	215	170 (80%)	45 (20%)
patients, n (%)	824	692 (84%)	128 (16%)
assessments, n (%)	408k	236k (95%)	22k (5%)
observations, n (%)	4.89M	4.63M (92%)	264k (5%)
Demographics			
Age, years	53 (23–76)	53 (24–76)	56 (27–75)
Female, n (%)	317 (38%)	276 (40%)	40 (31%)
Patient History[1]			
Disease Status, n (%)			
cardiovascular disease	119 (14%)	98 (14%)	21 (16%)
endocrine disorder	146 (18%)	118 (17%)	28 (22%)
epilepsy	78 (9%)	72 (10%)	6 (5%)
musculoskeletal disorder	75 (9%)	64 (9%)	11 (9%)
neurological disorder	384 (47%)	323 (47%)	61 (48%)
respiratory disease	126 (15%)	109 (16%)	17 (13%)
vascular disease	182 (22%)	147 (21%)	35 (27%)
Other comorbidity, n (%)			
diffuse brain injury	73 (9%)	59 (9%)	14 (11%)
hypertension	167 (20%)	134 (19%)	33 (26%)
brain hypoxia-anoxia	43 (5%)	29 (4%)	14 (11%)
subarachnoid haemorrhage	83 (10%)	63 (9%)	20 (16%)
haemorrhagic stroke	30 (4%)	18 (3%)	12 (9%)
stroke (non-specified)	46 (6%)	34 (5%)	12 (9%)
gastrostomy-peg	100 (12%)	94 (14%)	6 (5%)
type-2 diabetes	103 (12%)	82 (12%)	21 (16%)
prev. surgery (non-specific)	81 (10%)	74 (11%)	7 (5%)
prev. surgery (neurosurgical)	64 (8%)	58 (8%)	5 (4%)
prev. surgery (orthopaedic)	66 (8%)	57 (8%)	9 (7%)
prev. cardiac arrest	53 (6%)	39 (6%)	14 (11%)
Study characteristic(s)			
Patient cohort(s)[2], n (%)			
Brain Injury	166 (15%)	129 (14%)	37 (20%)
Long-term Stay	62 (5%)	58 (6%)	4 (2%)
Neurological Disorder	94 (8%)	81 (8%)	13 (7%)
Other[a]	131 (11%)	110 (12%)	21 (11%)
PDoC[b]	215 (19%)	194 (20%)	21 (11%)
Rehab	259 (23%)	228 (24%)	31 (16%)
Stroke	215 (19%)	153 (16%)	62 (33%)
Enrolment, weeks	20 (2–170)	23 (3–170)	14 (1–39)
Observations, per day[c]	1 (2–21)	1 (2–16)	1 (2–14)
Infections[3]			
total (per 1000 patient-days)	2355 (20)	2132 (19)	223 (18)
per-patient	2 (1–9)	2 (1–9)	1 (1–4)
events[d](%)	28,757 (7%)	18,330 (8%)	2077 (10%)
Incomplete assessments, n (%)	7595 (3%)	7087 (3%)	508 (3%)

[1] Most common disease/disorder-type and comorbidity observed, loosely grouped.
[2] Note, patients may change characteristic or be denoted by multiple characteristics over data collection period.
[3] Infections are defined by the timing of acute antibiotic prescriptions (non-prophylactically administered, non-topically administered antibiotics).
[a] Patients with other neuro-disability and/or neuro-behavioural conditions;
[b] PDoC, Patients with Prolonged Disorders of Consciousness;
[c] Median (Min-Max) values reported.
[d] Positive infection events, with right-censoring determined at 7-days from assessment.

Analysis of model performance characteristics in comparison to NEWS2

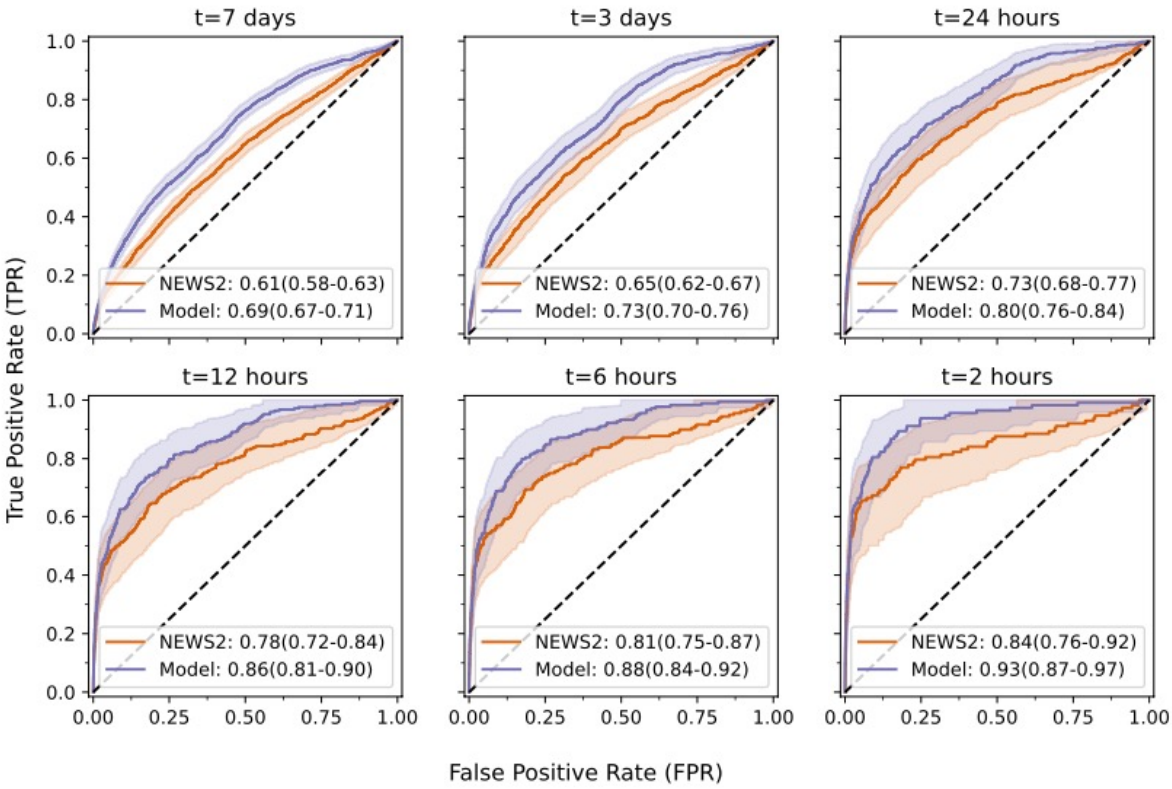


Figure 3: **Analysis of model performance characteristics in comparison to NEWS2**. Area under the receiver operator curves, $auroc(t)$, at shortening times, t, to infection events for NEWS2 as compared to our model. Plots depict the overall "pointwise" auroc calculated on n=22k samples, plus the 95th percentile (shaded-area) over 500 random patient-wise bootstrap samples of the held-out data.

Risk stratification performance outcomes for hospital acquired infections

Table 2: **Risk stratification performance outcomes for hospital acquired infections**. Comparison of survival model calibration and performance outcome metrics between NEWS2 scores—the standard of care—and MEMORI risk predictions. Performance outcome are represented as the overall "point-wise" metrics over the held-out testing set (n=22k samples) with 95th percentile confidence intervals reported over 500 random patient-wise bootstrap repetitions.

	NEWS2	MEMORI	p[1]
Hazard Ratio	1.077 (0.948–1.224)	2.427 (1.797–3.276)	***
C-Index[a]	0.605 (0.564–0.648)	0.684 (0.640–0.725)	***
AUROC[b]			
7 days	0.607 (0.570–0.638)	0.689 (0.656–0.722)	***
3 days	0.647 (0.596–0.693)	0.729 (0.684–0.774)	***
24 hrs.	0.731 (0.652–0.799)	0.803 (0.744–0.856)	***
12 hrs.	0.777 (0.675–0.870)	0.856 (0.799–0.925)	***
6 hrs.	0.811 (0.708–0.911)	0.883 (0.810–0.950)	***
2 hrs.	0.843 (0.695–0.959)	0.925 (0.834–0.983)	***
IBS[c]	1.726 (1.432–1.969)	0.089 (0.081–0.097)	-

[a] C-Index, Concordance Index C-index, incorporating the inverse probability of censoring weights (IPCW) adjustment for highly censored data.
[b] AUROC, time-dependent area under the receiver operating characteristic curve.
[c] IBS, integrated brier score, a measure of overall model calibration across all time points (lower is better).
Benjamini-Hochberg adjusted p-values, *p<0.05, **p<0.001, ***p<0.0001.

Risk stratification performance for hospital acquired infections (HAI)

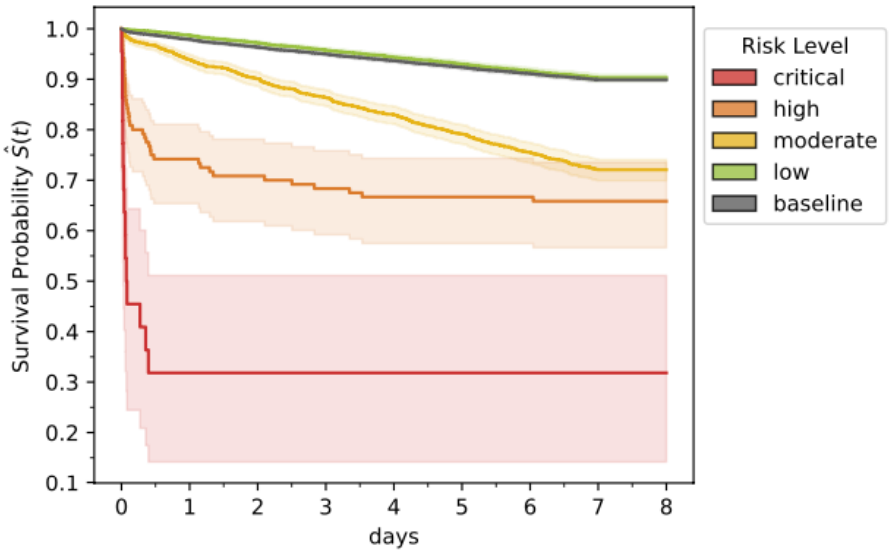


Figure 4: **Risk stratification performance for hospital acquired infections (HAI)**. Evaluation of ML-derived risk prediction model in the out-of-sample test data. Predicted risk scores [log-hazard-ratio] were first grouped by [low, moderate, high, or severe]-risk of developing a HAI. Kaplan-Meier estimator of the survival functions for each group were empirically calculated over a 7-day horizon. Baseline survival rates were calculated over the held-out test data for comparison. A log-rank test indicated that survival rates for [moderate, high, and critical]-risk were significantly different from baseline and low-risk survival rates ($p<0.001$).

Explainability of device

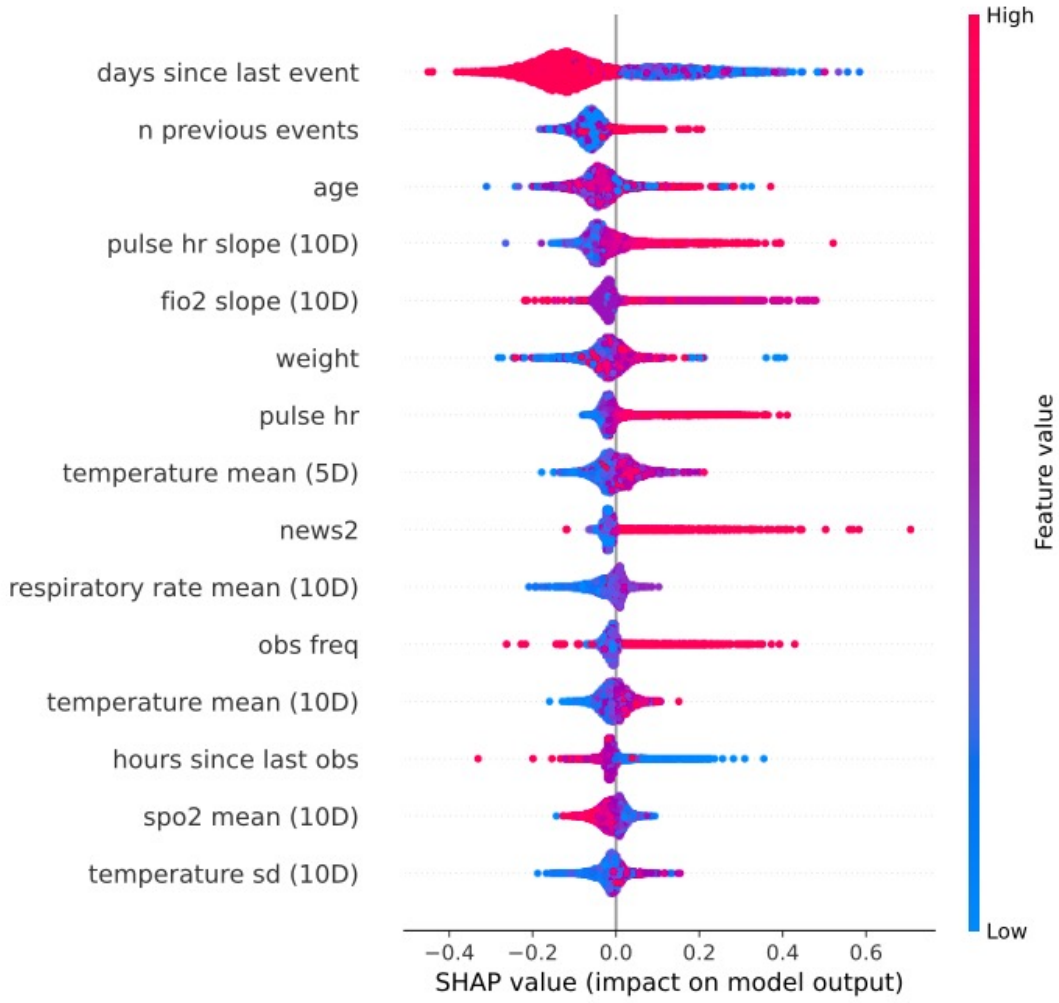
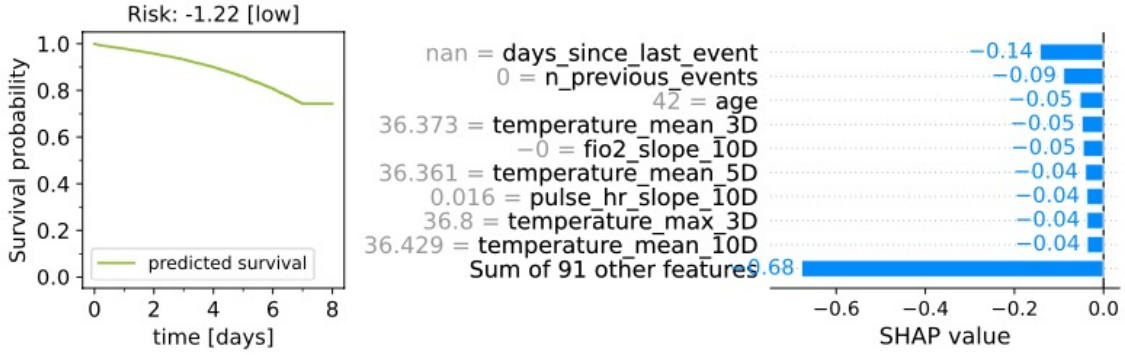
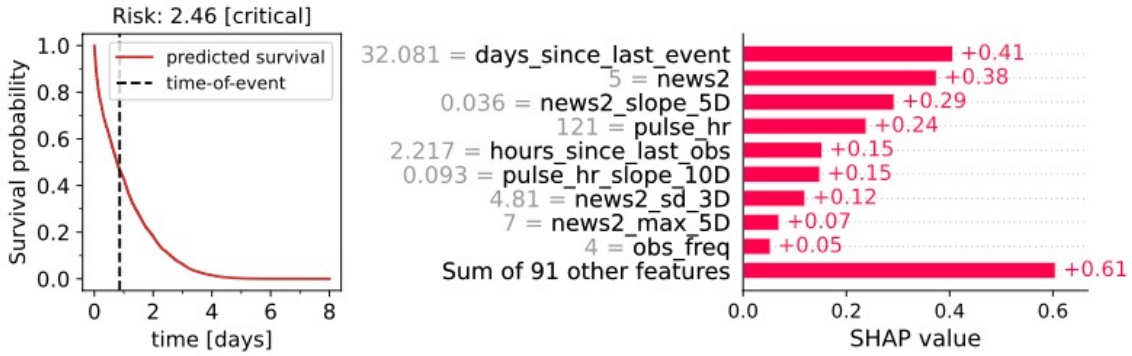


Figure 5: **Explainability of device**. SHAP-based feature importance ranking for the top ranking features. Higher feature importance, as measured by SHAP values, indicate a greater impact on the model's prediction outcom; positive SHAP values indicate features that contribute to a shorter survival time, while negative SHAP values represent features that are associated with longer survival times.

Personalised explainability dashboard for an individual patient



(a) Control patient (right-censored)



(b) Patient who experienced an infection (t≈1 day)

Figure 6: **Personalised explinability dashboard for an individual patient**. Comparison of model-estimated survival predictions for two example patients in the held-out test set: **(a)** a patient who was right-censored at t=7 days and **(b)** a patient who developed an infection at t≈1 days from model prediction. The model-estimated survival function for an individual patient with feature vector $\mathbf{x}$, defined as $S(t \mid \mathbf{x}) = S_0(t)e^{(\mathbf{x}^\top \beta)}$ where $S_0(t)$ is the baseline survival function, estimated by Breslow's estimator. The actual time-of-event is noted by a vertical line, otherwise the data is considered right-censored. The accompanying feature importance plot, represented as local SHAP values, corresponds to the same model-estimated prediction for that individual. Higher feature importance indicates a greater impact on the model's prediction outcome; positive SHAP values indicate features that contribute to a shorter survival time, while negative SHAP values represent features that are associated with longer survival times for these individuals. Note, 'nan' days since last event indicates that this patient has not experienced a previous infection inn their historic dataset.

Alerting performance outcomes for hospital acquired infections

Table 3: **Alerting performance outcomes for hospital acquired infections**. Comparison of infection alerting performance between standard-of-care, NEWS2, and MEMORI, at increasing NEWS2 scores. Overall "point-wise" sensitivity and precision outcomes are computed on a per-event basis, with 95th percentile confidence intervals reported over patient-wise 500 random bootstrap repetitions.

	NEWS2		MEMORI				
NEWS2	Sensitivity	Precision	Risk Score[a]	Sensitivity	Precision	h[1]	p[2]
1.0+	0.932 (0.770–0.953)	0.127 (0.118–0.138)	-0.499	0.932 (0.764–0.944)	0.153 (0.144–0.168)	-0.076	***
2.0+	0.801 (0.540–0.850)	0.155 (0.138–0.172)	-0.102	0.801 (0.564–0.851)	0.206 (0.188–0.226)	-0.134	***
3.0+	0.658 (0.333–0.694)	0.198 (0.168–0.231)	0.246	0.658 (0.397–0.694)	0.266 (0.239–0.297)	-0.161	***
4.0+	0.479 (0.208–0.506)	0.289 (0.237–0.362)	0.715	0.479 (0.207–0.507)	0.341 (0.285–0.403)	-0.112	*
5.0+	0.384 (0.134–0.408)	0.374 (0.299–0.476)	0.992	0.384 (0.140–0.410)	0.395 (0.330–0.481)	-0.043	0.526
6.0+	0.219 (0.061–0.222)	0.397 (0.264–0.536)	1.545	0.219 (0.043–0.225)	0.522 (0.354–0.679)	-0.252	*
7.0+	0.137 (0.032–0.181)	0.453 (0.273–0.645)	1.749	0.137 (0.025–0.183)	0.543 (0.350–0.731)	-0.180	0.205
8.0+	0.089 (0.016–0.160)	0.593 (0.333–0.858)	2.074	0.089 (0.017–0.162)	0.618 (0.395–0.889)	-0.052	0.785
9.0+	0.068 (0.008–0.142)	0.607 (0.286–1.000)	2.279	0.068 (0.008–0.143)	0.686 (0.426–1.000)	-0.165	0.516
10.0+	0.027 (0.000–0.117)	0.636 (0.000–1.000)	2.519	0.027 (0.000–0.117)	0.615 (0.000–1.000)	0.043	0.916
11.0+	0.021 (0.000–0.059)	0.571 (0.000–1.000)	2.639	0.021 (0.000–0.059)	0.545 (0.000–1.000)	0.052	0.914

[a] MEMORI infection risk score, as determined by the log-hazard ratio. Corresponding MEMORI alert thresholds are calculated based on the closest match at $\leq$ NEWS2 sensitivity at each given threshold.
[1] Cohen's h, effect size for proportions;
[2] Differences in overall "point-wise" precision @ matched sensitivity between NEWS2 and MEMORI are computed using a z-proportions test. See section **??** for more details;
Benjamini-Hochberg adjusted p-values, *p<0.05, **p<0.001, ***p<0.0001.

Retrospective real-world validation of model performance of MEMORI alerting, as compared to baseline standard-of-care, NEWS2 alerting.

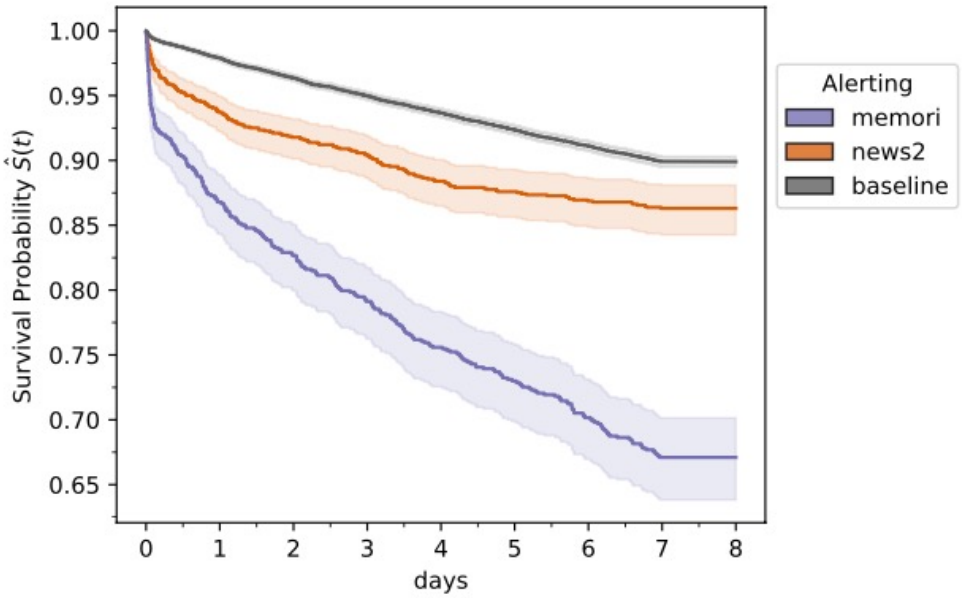


Figure 7: **Retrospective real-world validation of model performance of MEMORI alerting, as compared to baseline standard-of-care, NEWS2 alerting**. Empirically calculated Kaplan-Meier estimator of the survival functions for (1) control patients where NEWS2 alerted for infection and (2) case patients where MEMORI alerted for infection. Baseline survival rates are calculated in the control group only (i.e. those patients with and without a NEWS2 alert for infection).

Analysis of device alerting performance, as compared to baseline standard-of-care, NEWS2 alerting stratified by sex.

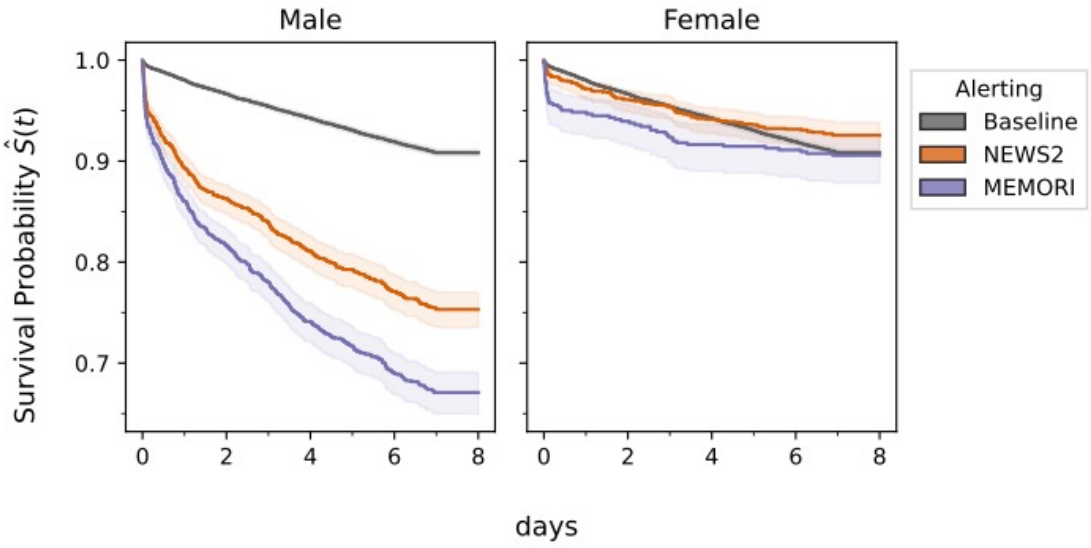


Figure 8: **Analysis of device alerting performance, as compared to baseline standard-of-care, NEWS2 alerting stratified by sex**. Empirically calculated Kaplan-Meier estimator of the survival functions for (1) control patients where NEWS2 alerted for infection and (2) case patients where MEMORI alerted for infection. Baseline survival rates are calculated in the control group only (i.e. those patients with and without a NEWS2 alert for infection).

Analysis of device alerting performance, as compared to baseline standard-of-care, NEWS2 alerting stratified by age-range.

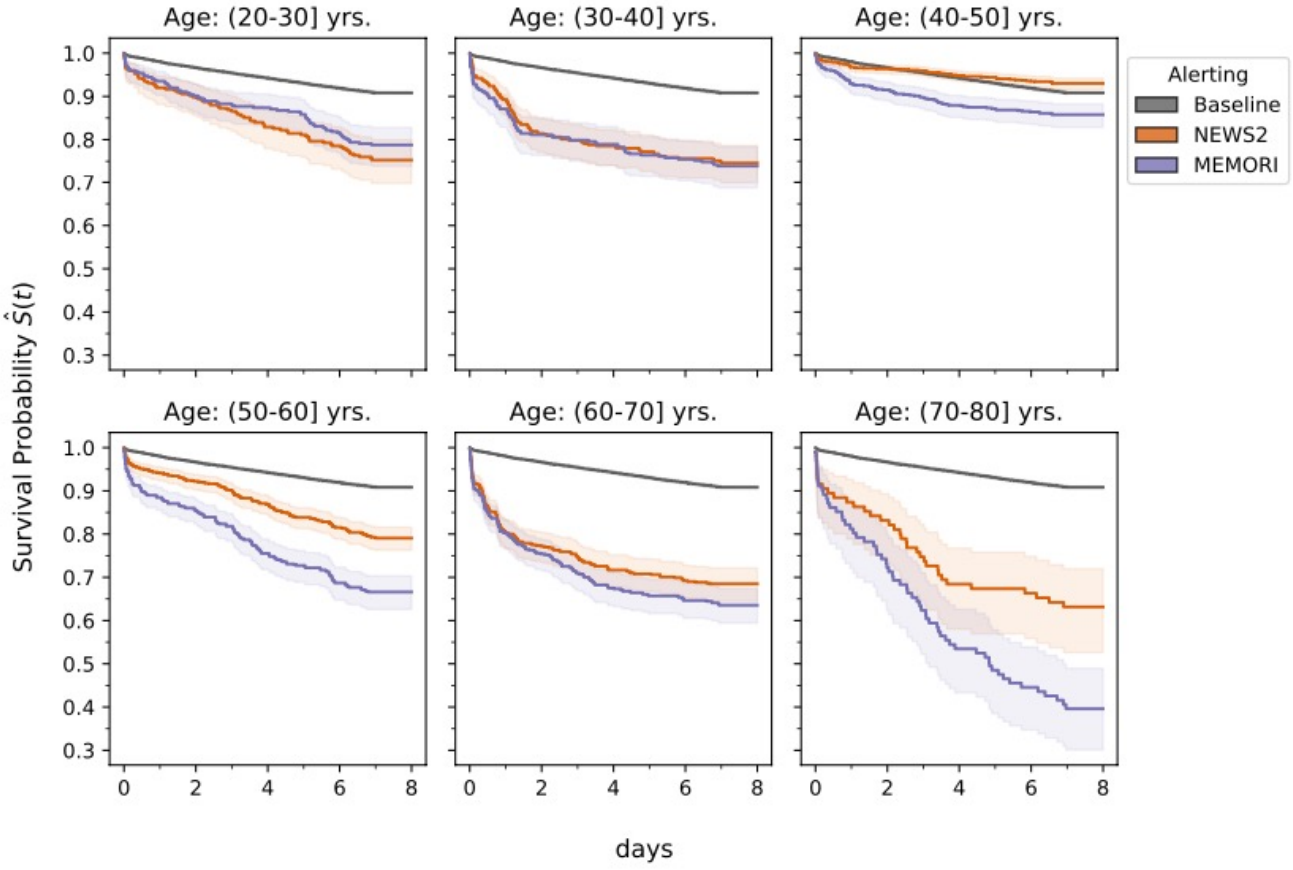


Figure 9: **Analysis of device alerting performance, as compared to baseline standard-of-care, NEWS2 alerting stratified by age-range**. Empirically calculated Kaplan-Meier estimator of the survival functions for (1) control patients where NEWS2 alerted for infection and (2) case patients where MEMORI alerted for infection. Baseline survival rates are calculated in the control group only (i.e. those patients with and without a NEWS2 alert for infection). Note: not enough representative samples to assess comparative alerting performance in patients older than 80 years old.

Analysis of device alerting performance, as compared to baseline standard-of-care, NEWS2 alerting for various patient cohorts.

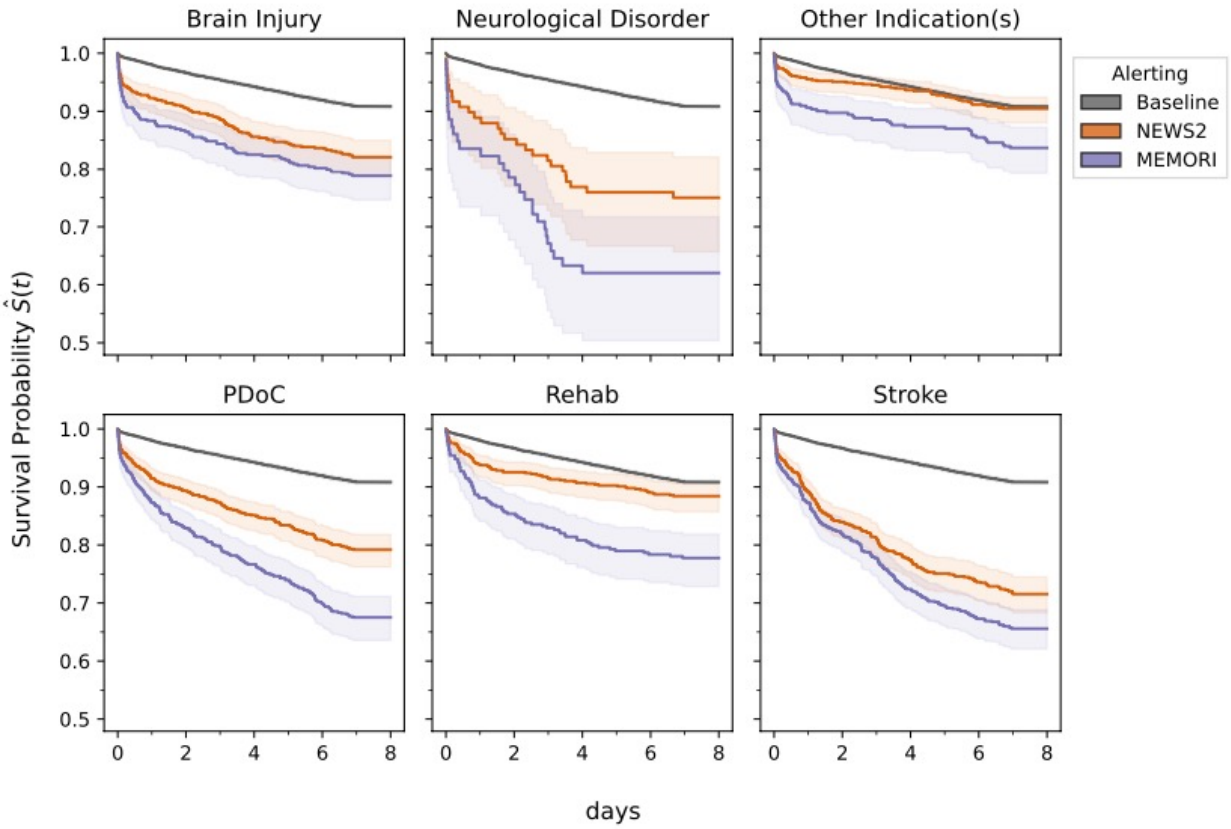


Figure 10: **Analysis of device alerting performance, as compared to baseline standard-of-care, NEWS2 alerting for various patient cohorts**. Empirically calculated Kaplan-Meier estimator of the survival functions for (1) control patients where NEWS2 alerted for infection and (2) case patients where MEMORI alerted for infection. Each panel represents assessment of alerting performance between patient's majority comorbidity subgroup cohort. Baseline survival rates are calculated in the control group only (i.e. those patients with and without a NEWS2 alert for infection).

Multivariable Cox Proportional Hazards Model with Three-Way Interactions

Table 4: **Multivariable Cox Proportional Hazards Model with Three-Way Interactions**. Comparing the association between risk score and hazard of clinical suspicion of infection across subgroups for MEMORI and NEWS2.

covariate	coef	exp(coef)	se(coef)	coef lower 95%	coef upper 95%	exp(coef) lower 95%	exp(coef) upper 95%	z	p	-log2(p)
score	0.11	1.11	0.02	0.07	0.14	1.07	1.15	5.75	***	26.75
model_type[T.news2]	-0.27	0.77	0.07	-0.41	-0.12	0.66	0.88	-3.65	***	11.90
sex[T.male]	0.34	1.41	0.10	0.15	0.53	1.16	1.70	3.52	***	11.18
age_cat[T.(30.0, 40.0]]	0.23	1.26	0.18	-0.13	0.59	0.88	1.80	1.27	0.21	2.28
age_cat[T.(40.0, 50.0]]	-0.05	0.95	0.11	-0.26	0.16	0.77	1.17	-0.46	0.64	0.64
age_cat[T.(50.0, 60.0]]	0.00	1.00	0.12	-0.23	0.23	0.80	1.25	0.01	1.00	0.01
age_cat[T.(60.0, 70.0]]	0.02	1.02	0.10	-0.17	0.21	0.85	1.24	0.24	0.81	0.30
age_cat[T.(70.0, 80.0]]	0.09	1.09	0.19	-0.29	0.47	0.75	1.60	0.47	0.64	0.64
age_cat[T.(80.0, 90.0]]	0.66	1.94	0.55	-0.42	1.74	0.66	5.72	1.20	0.23	2.11
patient_type[T.long-term-stay]	-0.12	0.88	0.12	-0.36	0.12	0.70	1.12	-1.00	0.32	1.67
patient_type[T.neurological-disorder]	0.56	1.74	0.20	0.16	0.95	1.18	2.57	2.79	*	7.55
patient_type[T.other]	-0.02	0.98	0.09	-0.19	0.15	0.82	1.16	-0.26	0.80	0.33
patient_type[T.pdoc]	0.01	1.01	0.10	-0.19	0.21	0.83	1.23	0.07	0.94	0.08
patient_type[T.rehab]	-0.17	0.84	0.07	-0.31	-0.03	0.74	0.97	-2.44	*	6.08
patient_type[T.stroke]	0.07	1.07	0.08	-0.08	0.22	0.92	1.25	0.88	0.38	1.39
score:model_type[T.news2]	-0.04	0.96	0.02	-0.08	0.01	0.92	1.01	-1.73	0.08	3.59
score:sex[T.male]	0.18	1.20	0.03	0.12	0.24	1.12	1.28	5.50	***	24.69
score:age_cat[T.(30.0, 40.0]]	0.14	1.15	0.09	-0.04	0.33	0.96	1.39	1.49	0.14	2.87
score:age_cat[T.(40.0, 50.0]]	-0.04	0.96	0.05	-0.14	0.07	0.87	1.07	-0.73	0.46	1.11
score:age_cat[T.(50.0, 60.0]]	0.20	1.22	0.08	0.04	0.36	1.04	1.43	2.41	*	5.98
score:age_cat[T.(60.0, 70.0]]	0.14	1.15	0.07	0.01	0.27	1.01	1.31	2.04	*	4.60
score:age_cat[T.(70.0, 80.0]]	0.58	1.78	0.20	0.18	0.98	1.19	2.65	2.82	***	7.69
score:age_cat[T.(80.0, 90.0]]	0.44	1.55	0.35	-0.24	1.11	0.78	3.04	1.26	0.21	2.26
score:patient_type[T.long-term-stay]	-0.27	0.76	0.16	-0.59	0.05	0.56	1.05	-1.66	0.10	3.37
score:patient_type[T.neurological-disorder]	0.20	1.22	0.13	-0.06	0.45	0.94	1.57	1.49	0.14	2.87
score:patient_type[T.other]	0.02	1.02	0.06	-0.10	0.14	0.90	1.16	0.33	0.74	0.44
score:patient_type[T.pdoc]	0.13	1.14	0.06	0.01	0.25	1.01	1.29	2.10	*	4.81
score:patient_type[T.rehab]	0.08	1.08	0.06	-0.03	0.19	0.97	1.21	1.39	0.17	2.59
score:patient_type[T.stroke]	0.22	1.24	0.06	0.11	0.33	1.12	1.39	3.92	***	13.44
model_type[T.news2]:sex[T.male]	0.09	1.09	0.08	-0.08	0.25	0.92	1.29	1.01	0.31	1.67
model_type[T.news2]:age_cat[T.(30.0, 40.0]]	-0.08	0.92	0.24	-0.55	0.40	0.57	1.49	-0.32	0.75	0.42
model_type[T.news2]:age_cat[T.(40.0, 50.0]]	-0.18	0.83	0.11	-0.40	0.03	0.67	1.03	-1.67	0.10	3.38
model_type[T.news2]:age_cat[T.(50.0, 60.0]]	0.03	1.03	0.14	-0.24	0.29	0.79	1.34	0.22	0.83	0.27
model_type[T.news2]:age_cat[T.(60.0, 70.0]]	0.07	1.08	0.11	-0.14	0.29	0.87	1.33	0.67	0.50	0.99
model_type[T.news2]:age_cat[T.(70.0, 80.0]]	-0.34	0.71	0.21	-0.75	0.06	0.47	1.06	-1.66	0.10	3.36
model_type[T.news2]:age_cat[T.(80.0, 90.0]]	-0.12	0.89	0.15	-0.41	0.18	0.66	1.19	-0.79	0.43	1.21
model_type[T.news2]:patient_type[T.long-term-stay]	-0.12	0.89	0.15	-0.41	0.18	0.66	1.19	-0.79	0.43	1.21
model_type[T.news2]:patient_type[T.neurological-disorder]	0.22	1.25	0.20	-0.18	0.62	0.84	1.86	1.09	0.28	1.86
model_type[T.news2]:patient_type[T.other]	-0.14	0.87	0.09	-0.32	0.04	0.73	1.04	-1.51	0.13	2.92
model_type[T.news2]:patient_type[T.pdoc]	0.03	1.03	0.11	-0.18	0.24	0.84	1.27	0.30	0.77	0.38
model_type[T.news2]:patient_type[T.rehab]	-0.24	0.79	0.07	-0.39	-0.10	0.68	0.91	-3.24	***	9.70
model_type[T.news2]:patient_type[T.stroke]	-0.19	0.82	0.09	-0.36	-0.02	0.70	0.98	-2.21	*	5.21
score:model_type[T.news2]:sex[T.male]	-0.02	0.98	0.04	-0.10	0.05	0.91	1.05	-0.57	0.57	0.82
score:model_type[T.news2]:age_cat[T.(30.0, 40.0]]	-0.16	0.85	0.09	-0.33	0.01	0.72	1.01	-1.87	0.06	4.03
score:model_type[T.news2]:age_cat[T.(40.0, 50.0]]	0.01	1.01	0.05	-0.09	0.11	0.91	1.12	0.23	0.82	0.29
score:model_type[T.news2]:age_cat[T.(50.0, 60.0]]	-0.07	0.93	0.10	-0.27	0.13	0.76	1.14	-0.68	0.50	1.00
score:model_type[T.news2]:age_cat[T.(60.0, 70.0]]	0.06	1.06	0.12	-0.18	0.30	0.83	1.35	0.48	0.63	0.67
score:model_type[T.news2]:age_cat[T.(70.0, 80.0]]	-0.06	0.94	0.17	-0.39	0.27	0.68	1.31	-0.35	0.72	0.47
score:model_type[T.news2]:age_cat[T.(80.0, 90.0]]	-0.12	0.89	0.09	-0.30	0.06	0.74	1.07	-1.27	0.20	2.30
score:model_type[T.news2]:patient_type[T.long-term-stay]	-0.12	0.89	0.09	-0.30	0.06	0.74	1.07	-1.27	0.20	2.30
score:model_type[T.news2]:patient_type[T.neurological-disorder]	-0.06	0.95	0.11	-0.28	0.16	0.76	1.18	-0.51	0.61	0.71
score:model_type[T.news2]:patient_type[T.other]	-0.13	0.88	0.05	-0.23	-0.02	0.79	0.98	-2.41	*	5.99
score:model_type[T.news2]:patient_type[T.pdoc]	0.01	1.01	0.07	-0.12	0.13	0.88	1.14	0.08	0.94	0.09
score:model_type[T.news2]:patient_type[T.rehab]	-0.04	0.96	0.06	-0.17	0.08	0.85	1.08	-0.68	0.50	1.01
score:model_type[T.news2]:patient_type[T.stroke]	-0.00	1.00	0.06	-0.13	0.12	0.88	1.12	-0.06	0.95	0.08

To enable comparisons between NEWS2 and MEMORI, each score have been independently normalised to have zero mean and unit variance using the z-score.
p-values, *p<0.05; **p<0.01; ***p<0.005

Consolidated evaluation of NEWS2 and MEMORI performance characteristics

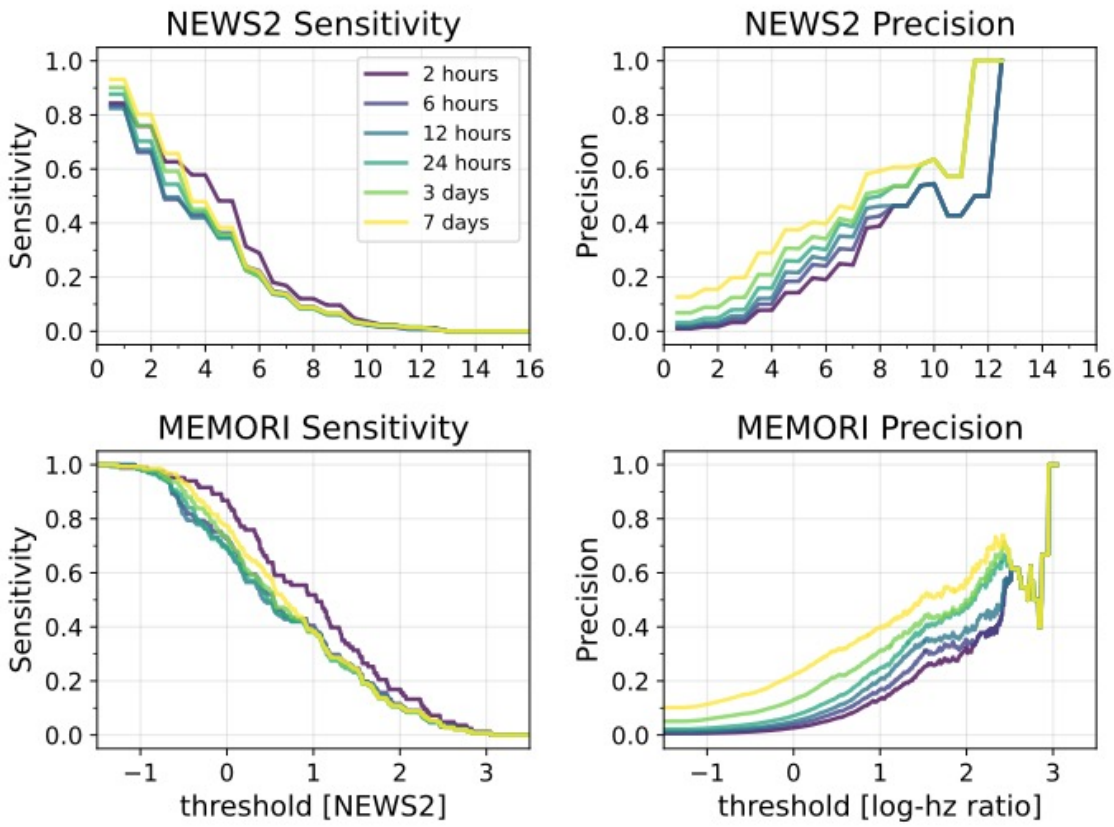


Figure 11: Consolidated evaluation of NEWS2 and MEMORI performance characteristics: sensitivity and precision (ppv) for shortening evaluation times, t, to infection events for varying threshold values of NEWS2 and model risk score $f(x)$, as measured by the log-hazard ratio. Note: Sensitivity and precision (ppv) values for each evaluation window are dependent on the prior distribution of event classes (positive or negative infection label) within each window.

Individual evaluation of NEWS2 and MEMORI performance characteristics

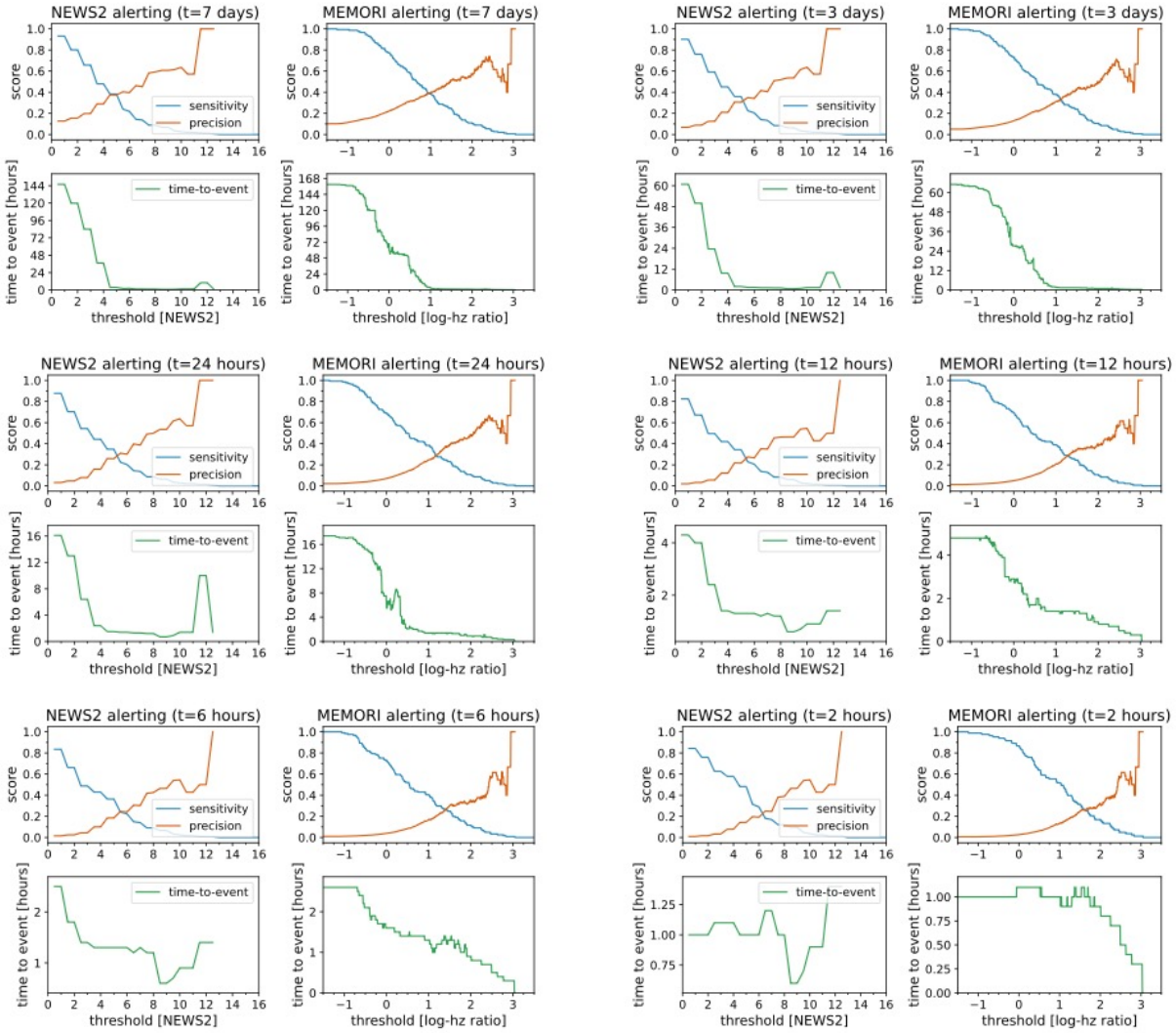


Figure 12: Individual evaluation of NEWS2 and MEMORI performance characteristics: sensitivity, precision (ppv), and time-to-event for shortening evaluation times, t, to infection events for varying threshold values of NEWS2 and model risk score $f(x)$, as measured by the log-hazard ratio.

Baseline survival function stratified by in-sample derived risk thresholds

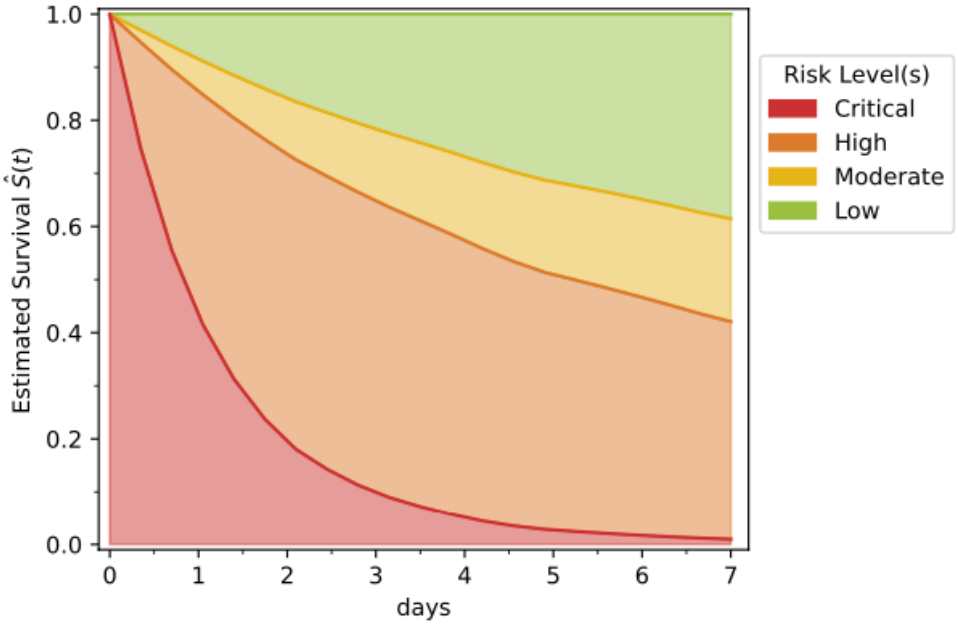


Figure 11: **Baseline survival function stratified by in-sample derived risk thresholds**. Baseline survival functions $S_0(t)$ over a 7-day time horizon, stratified by thresholds of model-derived risk scores $f(x)$. Each curve represents the estimated baseline survival probability for patients within a given risk stratum; $S_0(t)$ calculated using the Breslow estimator. The probability of experiencing the event (infection) at any given time point is equal to one minus the survival probability: $p = 1 - \hat{S(t)}$.