

## Supplementary file 3: Predictor measurements in derivation and validation cohorts

Predictor measurements were extracted from electronic health records.

**Supplementary Table 2:** Predictor measurements in original derivation settings and validation cohorts

Predictors	Derivation settings		Validation settings
	Unit and definition in derivation study	Timing of measurement in the derivation study	Definition and timing of measurement in primary care and nursing homes
<b>GAL-COVID-19 mortality</b>			
Age	Years	At admission	At admission
Sex	At birth		At admission
Lymphoma/leukemia/Hodgkin's disease	ICPC-2 codes B72, B73, B74	At PCR-confirmed covid-19 diagnosis	<u>JHN/AHA/AHN and PHARMO:</u> ICPC codes B72, B72.01, B72.02, B73, B74 <u>Ysis:</u> Information extracted from free text of patient history
Liver disease	ICPC-2 code D97	At PCR-confirmed covid-19 diagnosis	<u>JHN/AHA/AHN and PHARMO:</u> ICPC code D87 <u>Ysis:</u> Information extracted from free text of patient history
Dementia	ICPC-2 code P70	At PCR-confirmed covid-19 diagnosis	<u>JHN/AHA/AHN and PHARMO:</u> ICPC code P70 <u>Ysis:</u> Information extracted from free text of patient history
Ischemic heart disease	ICPC-2 codes K74, K75, K76	At PCR-confirmed covid-19 diagnosis	<u>JHN/AHA/AHN and PHARMO:</u> ICPC K74, K75, K76 <u>Ysis:</u> Information extracted from free text of patient history
Chronic Obstructive Pulmonary Disease	ICPC-2 code R95	At PCR-confirmed covid-19 diagnosis	<u>JHN/AHA/AHN and PHARMO:</u> ICPC R95 <u>Ysis:</u> Information extracted from free text of patient history
Diabetes mellitus	ICPC-2 codes T89, T90, W85	At PCR-confirmed covid-19 diagnosis	<u>JHN/AHA/AHN and PHARMO:</u> ICPC T90.01, T90.02, W84.02, W84.03 <u>Ysis:</u> Information extracted from free text of patient history
Chronic kidney disease	ICPC-2 code U99.01	At PCR-confirmed covid-19 diagnosis	<u>JHN/AHA/AHN and PHARMO:</u> ICPC U99.01 <u>Ysis:</u> Information extracted from free text of patient history
Predictors	Derivation settings		Validation settings
	Unit and definition in derivation study	Timing of measurement in derivation study	Definition and timing of measurement in hospital cohorts
<b>GAL-COVID-19 mortality</b>			
Age	Years	At covid-19 diagnosis	Registered once at hospital admission

<b>Sex</b>	At birth		Registered once at hospital admission
<b>Lymphoma/leukemia/Hodgkin's disease</b>	ICPC-2 codes B72, B73, B74	At PCR-confirmed covid-19 diagnosis	<u>CliniCo and COVID-PREDICT</u> : Recorded in patient history under hematological malignancies
<b>Liver disease</b>	ICPC-2 code D97	At PCR-confirmed covid-19 diagnosis	<u>CliniCo, COVID-PREDICT and COVID-OLD</u> : Registered once at hospital admission
<b>Dementia</b>	ICPC-2 code P70	At PCR-confirmed covid-19 diagnosis	<u>CliniCo, COVID-PREDICT and COVID-OLD</u> : Registered once at hospital admission
<b>Ischemic heart disease</b>	ICPC-2 codes K74, K75, K76	At PCR-confirmed covid-19 diagnosis	<u>CliniCo, COVID-PREDICT and COVID-OLD</u> : Registered once at hospital admission
<b>Chronic Obstructive Pulmonary Disease</b>	ICPC-2 code R95	At PCR-confirmed covid-19 diagnosis	<u>CliniCo, COVID-PREDICT and COVID-OLD</u> : Registered once at hospital admission
<b>Diabetes mellitus</b>	ICPC-2 codes T89, T90, W85	At PCR-confirmed covid-19 diagnosis	<u>CliniCo, COVID-PREDICT and COVID-OLD</u> : Registered once at hospital admission
<b>Chronic kidney disease</b>	ICPC-2 code U99.01	At PCR-confirmed covid-19 diagnosis	<u>CliniCo, COVID-PREDICT and COVID-OLD</u> : Registered once at hospital admission

#### 4C-Mortality Score

<b>Age</b>	Years	At hospital admission	Registered once at hospital admission
<b>Sex</b>	Sex at birth		Registered once at hospital admission
<b>Chronic cardiac disease</b>	Not reported for original model	Day of admission to hospital	<u>CliniCo, COVID-PREDICT and COVID-OLD</u> : Registered once at hospital admission from electronic health record
<b>Chronic respiratory disease (excluding asthma)</b>	Not reported for original model	Day of admission to hospital	<u>CliniCo, COVID-PREDICT and COVID-OLD</u> : Registered once at hospital admission from electronic health record
<b>Chronic renal disease</b>	Not reported for original model	Day of admission to hospital	<u>CliniCo, COVID-PREDICT and COVID-OLD</u> : Registered once at hospital admission from electronic health record
<b>Mild to severe liver disease</b>	Not reported for original model	Day of admission to hospital	<u>CliniCo, COVID-PREDICT and COVID-OLD</u> : Registered once at hospital admission from electronic health record
<b>Dementia</b>	Not reported for original model	Day of admission to hospital	<u>CliniCo, COVID-PREDICT and COVID-OLD</u> : Registered once at hospital admission from electronic health record
<b>Chronic neurological conditions</b>	Not reported for original model	Day of admission to hospital	<u>CliniCo, COVID-PREDICT and COVID-OLD</u> : Registered once at hospital admission from electronic health record

<b>Connective tissue disease</b>	Not reported for original model	Day of admission to hospital	<u>CliniCo, COVID-PREDICT and COVID-OLD</u> : Registered once at hospital admission from electronic health record
<b>Diabetes mellitus</b>	Not reported for original model	Day of admission to hospital	<u>CliniCo, COVID-PREDICT and COVID-OLD</u> : Registered once at hospital admission from electronic health record
<b>HIV or AIDS</b>	Not reported for original model	Day of admission to hospital	<u>CliniCo, COVID-PREDICT and COVID-OLD</u> : Registered once at hospital admission from electronic health record
<b>Malignancy</b>	Not reported for original model	Day of admission to hospital	<u>CliniCo, COVID-PREDICT and COVID-OLD</u> : Registered once at hospital admission from electronic health record
<b>Obesity</b>	Clinician defined (not further defined)	Day of admission to hospital	<u>COVID-OLD and COVID-PREDICT</u> : History recorded at hospital admission <u>CliniCo</u> : Computed based on BMI using weight and height
<b>Respiratory rate</b>	Breaths per minute	Day of admission to hospital	<u>CliniCo and COVID-OLD</u> : Registered as monitoring data <u>COVID-OLD</u> : recorded in Modified Early Warning Score (MEWS) at admission
<b>Peripheral oxygen saturation on room air</b>	%	Day of admission to hospital	<u>CliniCo and COVID-PREDICT</u> : Measured at hospital admission <u>COVID-OLD</u> : recorded in Modified Early Warning Score (MEWS) at admission
<b>Glasgow Coma Scale</b>	Score 15 or <15	Day of admission to hospital	<u>CliniCo</u> : Recorded by health professional at hospital admission ACVPU score <u>COVID-OLD</u> : Recorded by health professional regularly in intensive care and hospital monitored patients
<b>Urea</b>	Mmol/L	Day of admission to hospital	Measured at hospital admission
<b>C-reactive protein</b>	Mg/dL	Day of admission to hospital	Measured at hospital admission
<b>Xie model</b>			
<b>Age</b>	Years	Not Specified	Registered once at hospital admission
<b>Lactate dehydrogenase</b>	IU/L	Not Specified	Measured at hospital admission
<b>lymphocyte count</b>	10 <sup>9</sup> cells/L	Not Specified	Measured at admission
<b>Oxygen saturation</b>	%	Not Specified	Measured at admission <u>COVID-OLD</u> : recorded in Modified Early Warning Score (MEWS) at admission
<b>Wang model</b>			
<b>Age</b>	Years	At hospital admission	Registered once at hospital admission
<b>History of hypertension</b>	Recorded at hospital admission	At hospital admission	Registered once at hospital admission
<b>History of chronic heart disease</b>	Recorded at hospital admission	At hospital admission	Registered once at hospital admission
<b>NEWS2+ model</b>			

<b>Respiratory rate</b>	Breaths/minute	First available measure up to 48 h following hospital admission	Registered once at hospital admission <u>COVID-OLD</u> : recorded in Modified Early Warning Score (MEWS) at admission
<b>Oxygen saturation</b>	%	First available measure up to 48 h following hospital admission	Measured at hospital admission <u>COVID-OLD</u> : recorded in Modified Early Warning Score (MEWS) at admission
<b>Heart rate</b>	Beats/minute	First available measure up to 48 h following hospital admission	Registered once at hospital admission <u>COVID-OLD</u> : recorded in Modified Early Warning Score (MEWS) at admission
<b>Systolic blood pressure</b>	mmHg	First available measure up to 48 h following hospital admission	Part of monitoring data at hospital admission
<b>Body temperature</b>	Degree Celsius	First available measure up to 48 h following hospital admission	Part of monitoring data at hospital admission <u>COVID-OLD</u> : recorded in Modified Early Warning Score (MEWS) at admission
<b>Alertness</b>	AVPU score	First available measure up to 48 h following hospital admission	Recorded by health professional at hospital admission ACVPU score <u>COVID-OLD</u> : Recorded by health professional regularly in intensive care and hospital monitored patients
<b>Supplemental oxygen flow rate</b>	L/min	First available measure up to 48 h following hospital admission	Reported by health professional at hospital admission <u>COVID-OLD</u> : recorded in Modified Early Warning Score (MEWS) at admission
<b>Urea</b>	Mmol/L	First available measure up to 48 h following hospital admission	Measured at hospital admission
<b>Age</b>	Years	First available measure up to 48 h following hospital admission	Registered once at hospital admission
<b>C-reactive protein</b>	Mg/L	First available measure up to 48 h following hospital admission	Measured at hospital admission and repeated 3-4 times a week if indicated
<b>Estimated glomerular filtration rate</b>	ml/min	First available measure up to 48 h following hospital admission	Computed using MDRD equation using age, sex, and creatinine values
<b>Neutrophil count</b>	10 <sup>9</sup> cells/L	First available measure up to 48 h following hospital admission	Measured at hospital admission and repeated 3-4 times a week if indicated
<b>Neutrophil/lymphocyte ratio</b>		First available measure up to 48 h following hospital admission	Computed using serum Neutrophil and lymphocytes levels
<b>SOFA score</b>			
<b>Arterial oxygen tension</b>	MmHg	24-hour period after the onset of infection/admission for infection	Calculated using arterial or venous blood gas test levels at hospital admission
<b>Fraction of inspired oxygen ratio</b>	% 24-hour period after the onset of	24-hour period after the onset of	Calculated using arterial oxygen partial pressure and fractional

	infection/admission for infection	infection/admission for infection	inspired oxygen measured at hospital admission
<b>Glasgow Coma Scale</b>	Score 15 or <15	24-hour period after the onset of infection/admission for infection	Recorded by health professional at hospital admission
<b>Mean arterial pressure</b>	MmHg	24-hour period after the onset of infection/admission for infection	Computed using systolic and diastolic blood pressure measured at hospital admission
<b>Administration of vasopressors</b>	Dopamine ≤5 or Dobutamine (any dose) / Dopamine >5, Epinephrine ≤0.1, or norepinephrine ≤0.1 / Dopamine >15, Epinephrine >0.1, or norepinephrine >0.1	24-hour period after the onset of infection/admission for infection	<u>CliniCo and COVID-OLD</u> : Patient information at admission checked for vasopressors
<b>Serum creatinine</b>	mg/dL	24-hour period after the onset of infection/admission for infection	Measured at hospital admission
<b>Bilirubin</b>	mg/dL	24-hour period after the onset of infection/admission for infection	Measured at hospital admission
<b>Platelet count</b>	10 <sup>9</sup> cells/L	24-hour period after the onset of infection/admission for infection	Measured at hospital admission

#### APACHE-II Score

<b>Body temperature</b>	Rectal temperature degree Celsius	The worst parameters in the first 24 hours of hospitalization	Part of monitoring data at hospital admission <u>COVID-OLD</u> : recorded in Modified Early Warning Score (MEWS) at admission
<b>Heart rate</b>	Beats/minute	The worst parameters in the first 24 hours of hospitalization	Part of monitoring data at hospital admission <u>COVID-OLD</u> : recorded in Modified Early Warning Score (MEWS) at admission
<b>Breathing rate</b>	Breaths/minute	The worst parameters in the first 24 hours of hospitalization	Part of monitoring data at hospital admission
<b>Mean arterial pressure</b>	MmHg	The worst parameters in the first 24 hours of hospitalization	Computed using systolic and diastolic arterial pressure
<b>Arterial oxygen tension</b>	MmHg	The worst parameters in the first 24 hours of hospitalization	Calculated using arterial or venous blood gas test levels at hospital admission
<b>pH</b>		The worst parameters in the first 24 hours of hospitalization	Measured at hospital admission
<b>Potassium</b>	Mmol/L	The worst parameters in the first 24 hours of hospitalization	Measured at hospital admission
<b>Sodium</b>	Mmol/L	The worst parameters in the first 24 hours of hospitalization	Measured at hospital admission
<b>Creatinine</b>	Micromol/L	The worst parameters in the first 24 hours of hospitalization	Measured at hospital admission

<b>Haematocrit</b>	%	The worst parameters in the first 24 hours of hospitalization	Measured at hospital admission <u>COVID-PREDICT</u> : Not measured
<b>Leucocyte count</b>	10 <sup>9</sup> cells/L	The worst parameters in the first 24 hours of hospitalization	Measured at hospital admission
<b>Glasgow Coma Scale</b>	Score 15 or <15	The worst parameters in the first 24 hours of hospitalization	<u>COVID-OLD</u> : Recorded by health professional regularly in intensive care and hospital monitored patients
<b>Age</b>	Years	The worst parameters in the first 24 hours of hospitalization	Registered once at hospital admission
<b>Chronic health evaluation</b>	Binary: history of surgery, history of organ insufficiency, immunocompromised state	24-hour period after the onset of infection/admission for infection	Recorded once by health professional at hospital admission <u>COVID-PREDICT</u> : Not measured
<b>CURB-65 Score</b>			
<b>Alertness</b>	AVPU score AVPU, Alert vs. Confused/not alert (ACVPU classification, where A is alert, and CVPU are grouped as one score)	Not reported for original model	Recorded by health professional at hospital admission or AVPU score in cohorts
<b>Urea</b>	Mmol/L	Not reported for original model	Measured at hospital admission
<b>Respiratory rate</b>	Breaths/minute	Not reported for original model	Part of monitoring data at hospital admission
<b>Systolic blood pressure</b>	MmHg	Not reported for original model	Part of monitoring data at hospital admission
<b>Diastolic blood pressure</b>	MmHg	Not reported for original model	Part of monitoring data at hospital admission
<b>Age</b>	Years	Not reported for original model	Registered once at hospital admission