

COVID-19 Progression Calculator

The COVID Intelligence team



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with thanks to many experts!



APPRISE
AUSTRALIAN PARTNERSHIP FOR
PREPAREDNESS RESEARCH ON
INFECTIOUS DISEASE EMERGENCIES



CREID
PROTECTING THE PUBLIC FROM
EMERGING INFECTIOUS DISEASES



MONASH
University

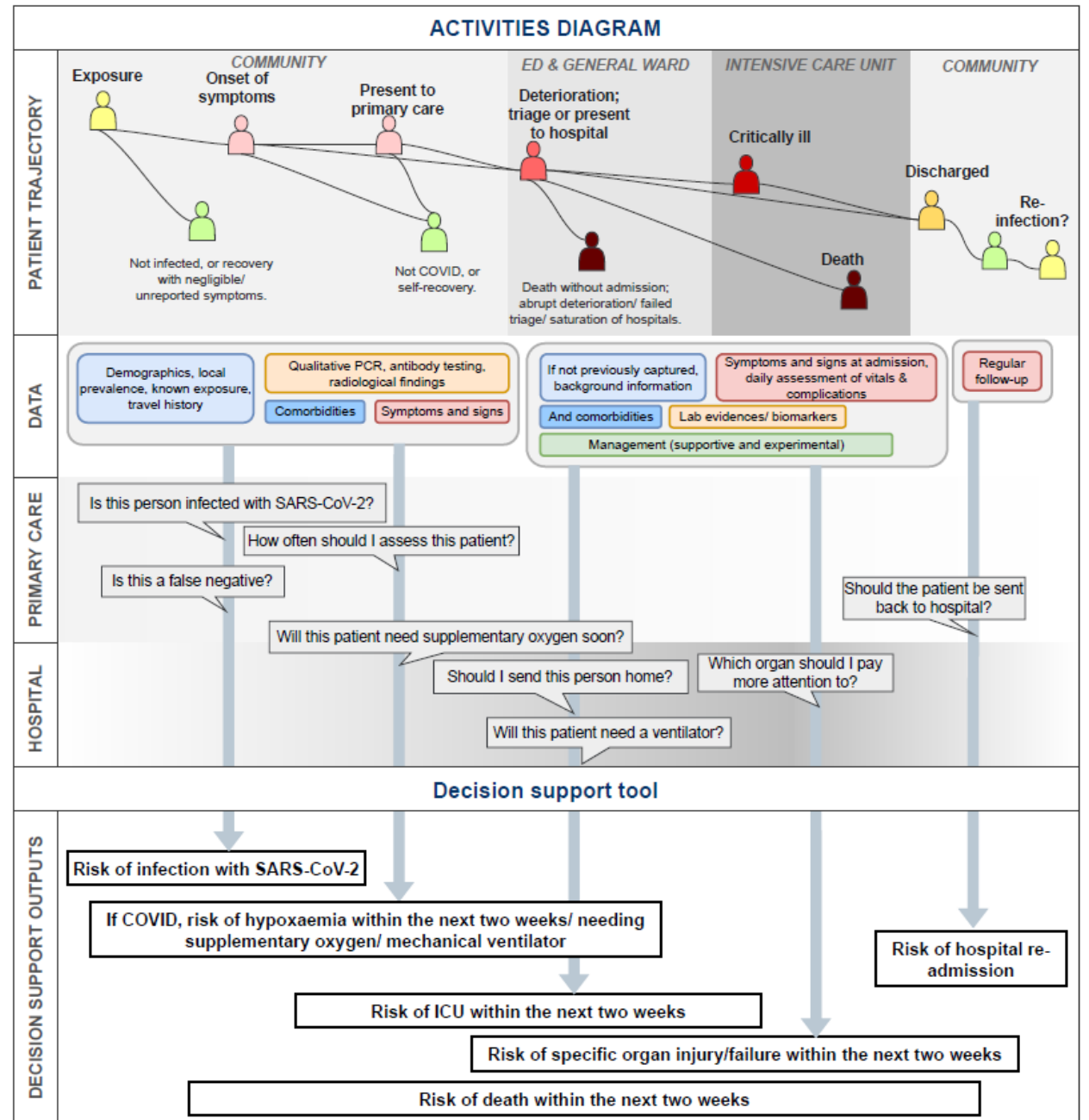


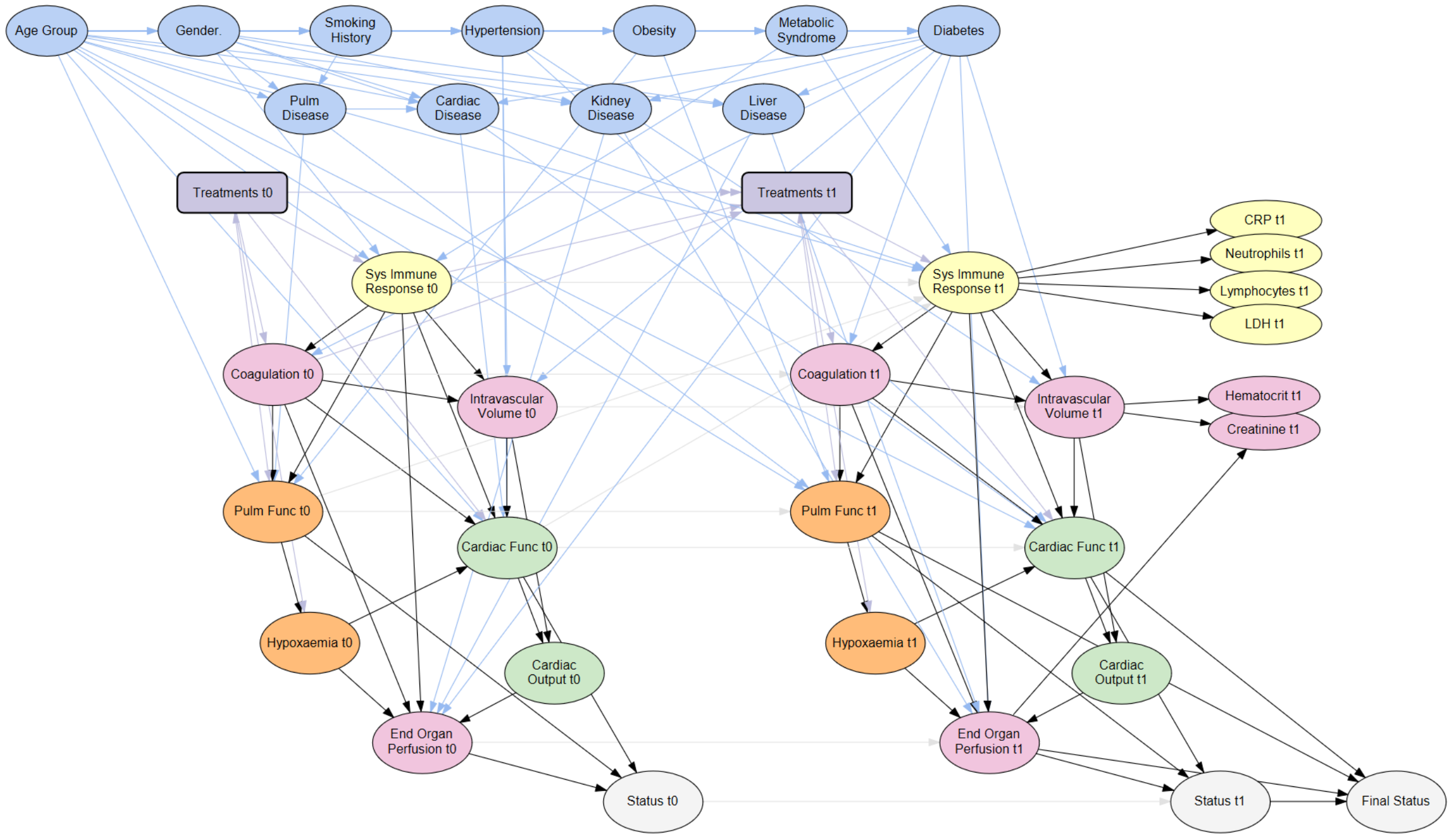
THE UNIVERSITY OF
SYDNEY



Decision support for COVID-19

COVID-Intelligence (COVID-I) project scope





COVID-1 Progression Calculator

covid1.org

COVID-1
COVID Intelligence
HOME ABOUT COVID-1 HOW THE CALCULATOR WORKS TERMS & CONDITIONS

COVID-1 is COVID Intelligence

[BACK TO COVID-1 HOME](#)

COVID-19 patient progression calculator

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- to diagnose, treat, cure or prevent any disease;
- for therapeutic purposes; or
- as a substitute for the advice of a health professional.

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PATIENT BACKGROUND

This calculator uses a model based on data provided by the ICDC group. The data consists of patients hospitalised with a suspected or confirmed case of COVID-19 from 21 countries during the period March 2020 to October 2021. All cases from 2021 are from Great Britain. For 2020, 86% of cases are from Great Britain, 2.3% from Malaysia, 2.4% from Poland, 2% from Russia and 1.2% from Brazil, with the remaining countries making up 4.5% of the data. Estimated distributions for background factors (such as age) and risk factors can be accessed by hovering over the 'i' information icons. [How the calculator works?](#)

Enter as much information as you have about the patient or patient group. Select 'NOT SPECIFIED' to use the statistics from the comparison group.

Age (years) 72	Sex Male	Vaccination status NOT SPECIFIED
<input type="checkbox"/> Compare patient with age group		
Time since admission Day of admission	ICU Status NOT SPECIFIED	Period Jul 2021 - Oct 2021 (Delta predominant)

Patient comorbidities

Comorbidities present before the onset of COVID-19 which are still present. Do not include comorbidities that developed following the onset of COVID-19 symptoms.

Chronic cardiac disease NOT SPECIFIED	Chronic kidney disease NOT SPECIFIED	Diabetes NOT SPECIFIED
Hypertension NOT SPECIFIED	Obesity NOT SPECIFIED	Chronic pulmonary disease Yes
Smoking NOT SPECIFIED	Liver disease NOT SPECIFIED	

Patient indicators

Enter the worst available measurement from the preceding 24 hours.

Heart rate (beats per minute) NOT SPECIFIED	Oxygen saturation (%) 85	Creatinine (µmol/L) NOT SPECIFIED
Neutrophils (% WBC) NOT SPECIFIED	Lymphocytes (% WBC) NOT SPECIFIED	NLR - Calculated NOT SPECIFIED

[ADD/REMOVE PATIENT INDICATOR](#)

PATIENT PROJECTIONS

Patient projections assume hospital admission and a standard level of care. [See data sources?](#)

Comparing patient with Entire Cohort

Overall risk (entire patient episode)

20% Overall risk of **Death**
2.0x cohort risk

9% Overall risk of **Mech. ventilation**
1.8x cohort risk

Short term risk

3% Cumulative risk (after 24 hours) of **Death**
1.5x cohort risk

8% Cumulative risk (after 24 hours) of **Mech. ventilation**
1.6x cohort risk

Medium term risk

17% Cumulative risk (after 5 days) of **Death**
2.1x cohort risk

8% Cumulative risk (after 5 days) of **Mech. ventilation**
1.6x cohort risk

Current organ status

<p>Pulmonary</p> <ul style="list-style-type: none"> Reduced pulmonary function 1.5x Cohort risk (25%) Hypoxaemia 0.1x Cohort risk (22%) 	<p>Cardiac</p> <ul style="list-style-type: none"> Reduced cardiac function 1.1x Cohort risk (25%) Reduced cardiac output 1.1x Cohort risk (22%) 	<p>Vascular</p> <ul style="list-style-type: none"> Reduced end-organ supply 1.2x Cohort risk (22%) Abnormal coagulation 1.1x Cohort risk (21%) Reduced functional intravascular volume 1.2x Cohort risk (24%) 	<p>Immune System</p> <ul style="list-style-type: none"> Abnormal immune response 1.2x Cohort risk (25%)
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Organ status in 5 days

<p>Pulmonary</p> <ul style="list-style-type: none"> Reduced pulmonary function 1.1x Cohort risk (26%) Hypoxaemia 0.1x Cohort risk (24%) 	<p>Cardiac</p> <ul style="list-style-type: none"> Reduced cardiac function 1.1x Cohort risk (25%) Reduced cardiac output 1.2x Cohort risk (22%) 	<p>Vascular</p> <ul style="list-style-type: none"> Reduced end-organ supply 1.1x Cohort risk (24%) Abnormal coagulation equivalent risk 1.2x Cohort risk (24%) Reduced functional intravascular volume 1.2x Cohort risk (24%) 	<p>Immune System</p> <ul style="list-style-type: none"> High immune response 1.1x Cohort risk (25%)
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The COVID-19 patient progression calculator improves the management of COVID-19 patients.

COVID-19 patient progression calculator is a consortium initiative of the Australian Government and the Department of Health.

The COVID-19 patient progression calculator uses real-world data from hospitalised patients with COVID-19.

[PATIENT PROGRESSION CALCULATOR](#)

[PATIENT PROJECTIONS](#)

Users of the calculator must see [terms & conditions](#) for use.

Using the calculator

The COVID-19 patient progression calculator is under development. It is made available for research purposes only.

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COVID-19
CENTRAL DATA INITIATIVE

▲ For research purposes only

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PATIENT BACKGROUND

[↻ RESET](#)

This calculator uses a model based on data provided by the IDDO group. The data consists of patients hospitalised with a suspected or confirmed case of COVID-19 from 21 countries during the period March 2020 to October 2021. All cases from 2021 are from Great Britain. For 2020, 86% of cases are from Great Britain, 3.2% from Malaysia, 2.6% from France, 2% from Russia and 1.3% from Brazil, with the remaining countries making up 4.6% of the data.

Estimated distributions for background factors (such as age) and risk factors can be accessed by hovering over the 'i' information icons. [How the calculator works](#)

Enter as much information as you have about the patient or patient group. Select 'NOT SPECIFIED' to use the statistics from the comparison group.

Age (years)

72

Sex

Male

Vaccination status

NOT SPECIFIED

Compare patient with age group

Time since admission

Day of admission

ICU Status

NOT SPECIFIED

Period

Jul 2021 - Oct 2021 (Delta predominant)

Patient comorbidities

Comorbidities present before the onset of COVID-19 which are still present. Do not include comorbidities that developed following the onset of COVID-19 symptoms.

Chronic cardiac disease

NOT SPECIFIED

Chronic kidney disease

NOT SPECIFIED

Diabetes

NOT SPECIFIED

Hypertension

NOT SPECIFIED

Obesity

NOT SPECIFIED

Chronic pulmonary disease

Yes

Smoking

NOT SPECIFIED

Liver disease

NOT SPECIFIED

Patient indicators

Enter the worst available measurement from the preceding 24 hours.

Heart rate (beats per minute)

NOT SPECIFIED

Oxygen saturation (%)

85

Creatinine (µmol/L)

NOT SPECIFIED

Neutrophils (10⁹/L)

Lymphocytes (10⁹/L)

NLR - Calculated

NOT SPECIFIED

[+ ADD/REMOVE PATIENT INDICATOR](#)

PATIENT PROJECTIONS

Overall risk (entire patient episode)

Overall risk of

Overall risk of

Patient indicators

Enter the worst available measurement from the preceding 24 hours.

Heart rate (beats per minute)

NOT SPECIFIED

Oxygen saturation (%)

85

Creatinine (μmol/L)

NOT SPECIFIED

Neutrophils
(10⁹/L)

Lymphocytes
(10⁹/L)

NLR - Calculated

NOT SPECIFIED

+ ADD/REMOVE PATIENT INDICATOR

PATIENT PROJECTIONS

Patient projections assume hospital admission and a standard level of care. See [data sources](#)

Comparing patient with: Entire Cohort

Overall risk (entire patient episode)

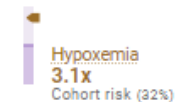
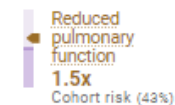


Short term risk

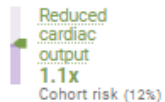


Current organ status

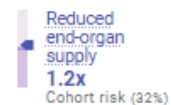
Pulmonary



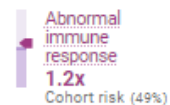
Cardiac



Vascular



Immune System

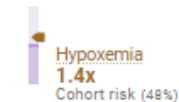
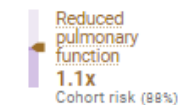


Medium term risk



Organ status in 5 days

Pulmonary



Cardiac



Vascular



Immune System



Model version: 20220929

Developing the COVID-I user-interface (UI)

- Regular meetings with the Clinical Advisory Group (CAG)
- Aug 2020: Early UI planning
- Sep 2021: Requirement workshop, facilitated by UI/UX expert (Shane Morris)
- Mar 2022: Post-requirement workshop iterations
- Oct 2022: UI/UX evaluations

Early discussion (Aug 2020)

- Pre-data
(Was another 6 months away!)
- Explain what the model can predict
- Preliminary understanding of what experts want to see (e.g., 24 hours vs 7 days)

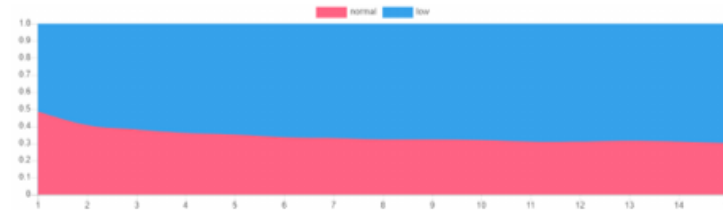
This report is generated for patient x with confirmed infection with SARS-CoV-2 at day t, all past and current observations and interventions need to be entered.

[Currently assuming an average hospitalised patient]

General trajectory (projection over time)

what do I need to do, why

- **Probability of SaO₂ drops below 90** (improve the legend, be more precise)



Add brief interpretation of the output

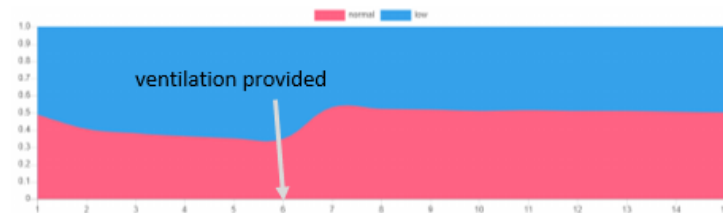
The patient's ability to oxygenate/ how well the patient responds to ventilatory support

Colour coding? Green, yellow, red going to ICU in 24hr vs 7days at the top, and zoom in if people are interested in figuring out why.

Giving more options, flag different risk levels

Always present worst state at the bottom

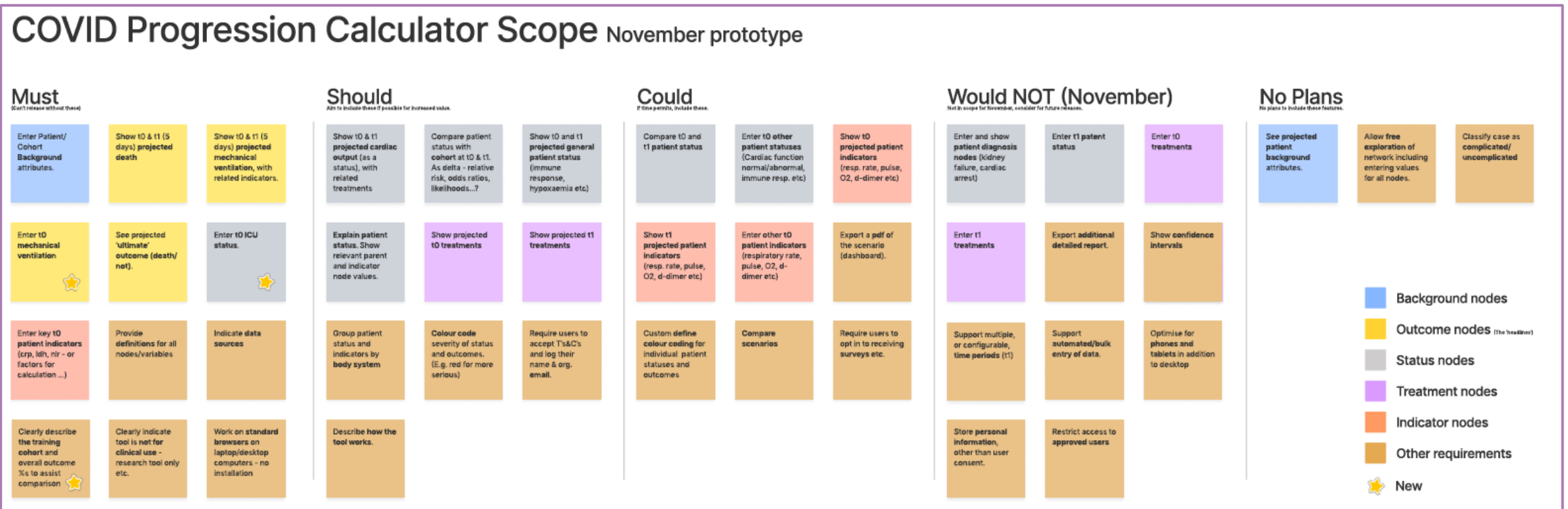
With ventilatory support from Day 6



[Although trigger for ventilatory support in practice can be complicated: if supplementary oxygen fails, blood gas FiO₂/SaO₂, PaO₂, PaCO₂, pH]

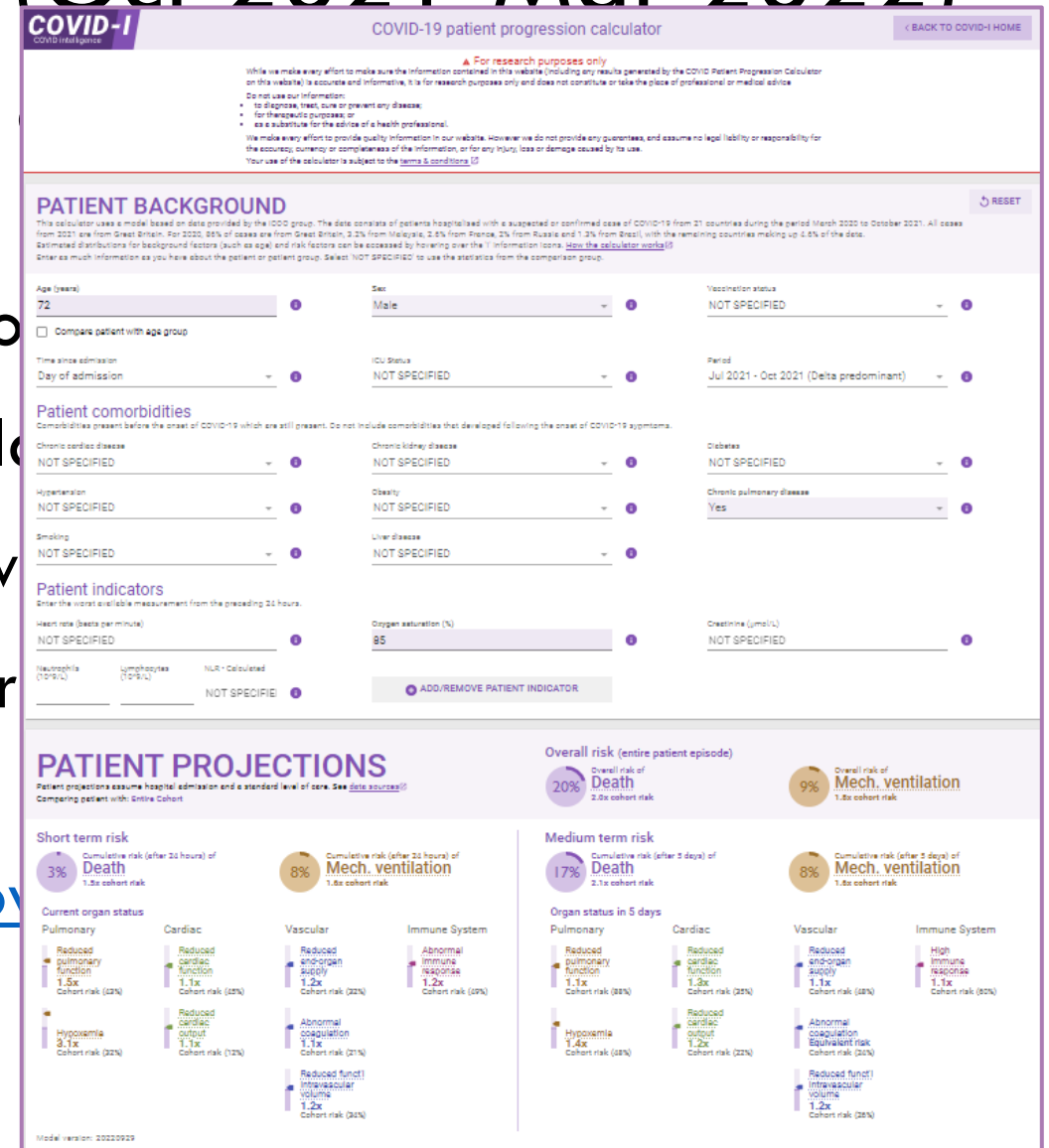
Requirement workshop (Sep 2021)

- Purpose: collect experts' input on what should be included in the UI
- Provided possibilities based on data-trained model
- Consensus at the end of session/ via follow-up



Post-requirement workshop (Oct 2021-Mar 2022)

- Discussion and iterations within smaller requirement workshop
 - What can be entered, and their format
 - Model modifications; e.g., interpolation
 - Which model outputs to present, with what units
 - Layout of model outputs (relative risk, absolute risk, etc.)
- Deployment of UI (~March 2022): [COVID-19 patient progression calculator](#)
- Usability evaluations (in progress)



Usability evaluations (Oct 2022)

Design and recruitment

USABILITY STUDY

- This usability study aims to investigate the **USABILITY** and **USEFULNESS** of the calculator:
 - In the specific COVID-19 scenario
 - Generally, as a class of tools to support clinical decision making
- This study is **NOT** investigating the quality/accuracy of the underlying predictions.
- Key study outcomes (key research questions):

Participant group	Recruited from
1. Familiar co-investigators	Members of existing project Clinical Advisory Group (from a range of organisations), with the calculator
2. Unfamiliar students and staff	Monash medical students and staff familiar with the subject matter, but not familiar with the calculator




MEDICAL STUDENTS (4th year plus) wanted for software usability study

\$50 Gift Card

Monash University Faculty of Information Technology is conducting research into the **use of artificial intelligence tools to assist clinicians in modelling and predicting patient outcomes.**

DETAILS

- Sessions are 1-hour long (1 session only), conducted **on campus at Monash Clayton.**
- You will use a **software tool** that predicts COVID-19 patient outcomes, followed by a questionnaire and discussion with a facilitator.
- Sessions conducted between **2nd November and 11th November 2022.**

REQUIREMENTS

- You must be 18 years or older and must be a **Monash University medical student currently studying 4th year or higher.**
- You should be comfortable using a standard computer setup of keyboard, mouse and monitor.

COMPENSATION

- You will be compensated with a **\$50 Coles Myer gift card.**

INTERESTED?
Scan the QR code to learn more and apply to be part of the study.



MUHREC project ID:
35900 – "Usability evaluation of the COVID-Intelligence decision support tool for COVID-19"






Usability evaluations - Protocol

- Preface: recording, gift card, intro/briefing, consent, subject background (e.g., familiarity with project/BN)
- Task 1 – Alternative probability presentations
- Task 2 – Evaluation: navigate to covid19.org
- Survey (completed during the session)
- Discussion
- Wrap-up

Usability evaluations

Alternative probability presentations

Short term risk

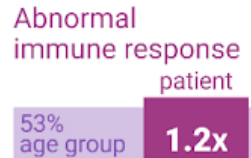
Immune system



A

Short term risk

Immune system



B

Short term risk

Immune system



C

Short term risk

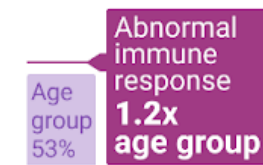
Immune system



D

Short term risk

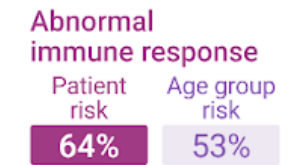
Immune system



E

Short term risk

Immune system



F

Usability evaluations

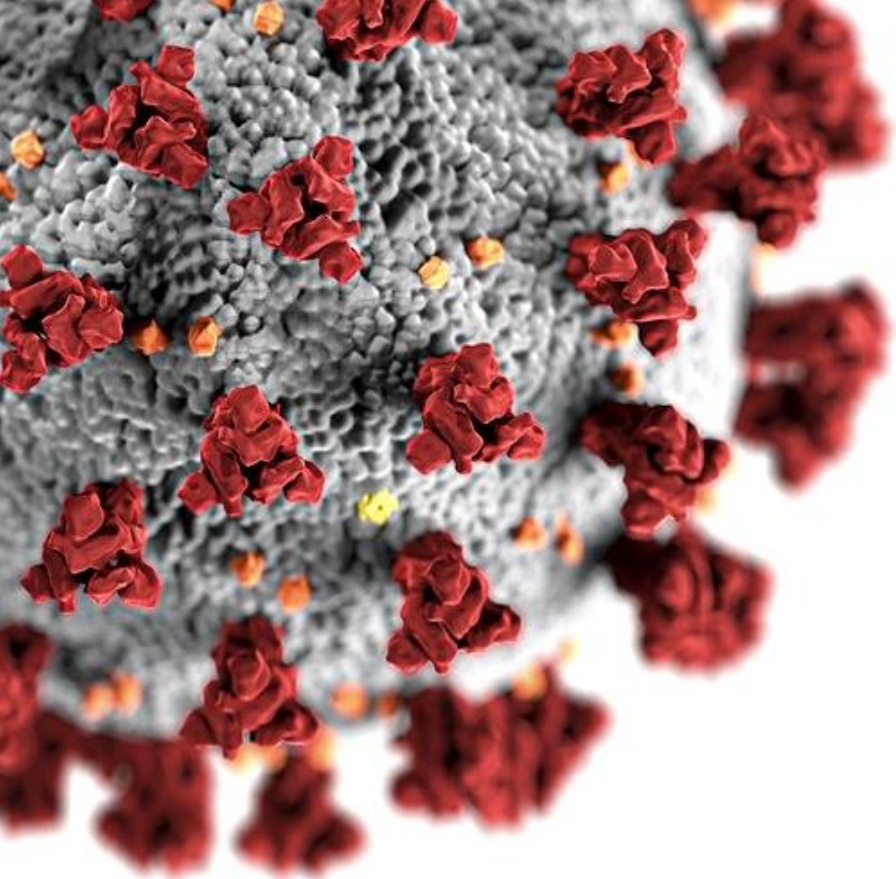
Survey

The standard survey has 10 questions:

1. I think that I would like to use this system frequently.
2. I found the system unnecessarily complex.
3. I thought the system was easy to use.
4. I think that I would need the support of a technical person to be able to use this system.
5. I found the various functions in this system were well integrated.
6. I thought there was too much inconsistency in this system.
7. I would imagine that most people would learn to use this system very quickly.
8. I found the system very cumbersome to use.
9. I felt very confident using the system.
10. I needed to learn a lot of things before I could get going with this system

3 additional questions will be added to the standard survey:

- I understood the language used in the application
- I think that I would need training to be able to use this application productively
- I understand how the application works



Current and Future Work

- Further validate the current model, e.g., IDDO omicron data, local (Australian) data
- Publications in progress (the applied model, UI, elicitation)
- Extend the current model, e.g., treatments
- Adaptation to applied settings, e.g., eMR integration (!)
- Adaptation to other respiratory infections
- Adaptation to other BN projects