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Outcomes of COVID-19 patients admitted to Australian intensive care units during the early phase of the pandemic

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Abstract:

Objectives
To describe the characteristics, interventions and outcomes of patients with COVID-19 admitted to intensive care unit (ICUs) in Australia.

Design
Multicentre, prospective, observational cohort study

Setting
77 ICUs across Australia.

Participants
Patients of all ages admitted to participating Australian ICUs with laboratory confirmed COVID-19 from 27 February to 30 June 2020.

Main outcomes
ICU mortality and resource utilisation, including peak bed occupancy and length of stay.

Results
The 204 patients who met inclusion criteria had a median age of 63 years (IQR 53-72) and were predominantly male 140/204 (68.6%). Common comorbidities were obesity, diabetes, and chronic cardiac disease. No comorbidities were reported for 73/204 (35.8%). Returning international travellers were the most common source of infection (114/204, 55.9%). Median peak ICU bed occupancy was 14% (IQR 9-16). Invasively ventilated patients (119/204, 58.3%,), compared to non-ventilated, had a longer median length of stay 16 days (IQR 9-28) vs 3 days (IQR 2-5) and higher ICU mortality 22% (95% CI 15-31) vs 5% (95% CI 1-12). Acute Physiology and Chronic Health Evaluation II (APACHE-II) score on day 1 (HR 1.15; 95% CI 1.09-1.21; $p<0.001$) and chronic cardiac disease (HR 3.38; 95% CI 1.46-7.83; $p=0.004$) were associated with higher ICU mortality.

Conclusion
To the end of June 2020, patients admitted to Australian ICUs with COVID-19 requiring invasive ventilation had lower mortality and a longer length of stay than has been reported globally. These findings highlight the importance of ensuring adequate local ICU capacity, particularly with the recent increase in COVID-19 infections in Australia.

Abstract word count: 250

"The known"
Existing literature concerning COVID-19 patients admitted to ICUs around the world has reported very high mortality.

"The new"
In Australia, to the end of June 2020, we found the mortality for invasively ventilated COVID-19 patients was lower than previously published elsewhere, while ICU length of stay was prolonged. Median peak COVID-19 ICU bed occupancy at study sites was 14% (IQR 9-16).

"The implications"
The prognosis for severe COVID-19 disease may not be as poor as previously described, although resource utilisation may be higher. These findings inform critical care planning, given the recent increase in COVID-19 infections in Australia.

Text word count: 100

Main Text:

Introduction

The COVID-19 pandemic has caused an unprecedented burden on intensive care units (ICUs) worldwide. In early case series, despite advanced ICU supports, including invasive mechanical ventilation and renal replacement therapy, ICU mortality rates were between 40-90%.[1-3] In a recently reported large scale randomised trial from the United Kingdom (UK), the mortality rate among invasively ventilated patients in the standard arm was 40%[4,5]. ICU mortality rates for COVID-19 are substantially higher than reported in previous epidemics of viral pneumonitis, including the 2009 H1N1 influenza pandemic, where reported rates were between 10 and 30%.[6,7]

Many reports of COVID-19 patient outcomes have come from healthcare systems whose capacity were exceeded with COVID-19 cases. In parts of China, Italy and New York, the rapid increase in COVID-19 cases permitted minimal time for preparation, with resultant shortages of resources, including beds[8], equipment (including personal protective equipment and ventilators), and appropriately trained staff[9,10]. The reported mortality may even have been underestimated, as many patients at the time of reporting were still undergoing treatment and whose final outcome was unknown[11,12].

In Australia, the first recorded case of COVID-19 was on 25 January 2020[13], and by 5 July 2020, only 8566 confirmed cases had been reported[14]. As the pandemic took hold in Australia, the Short PeRiod IncideNce sTudy of Severe Acute Respiratory Infection (SPRINT-SARI Australia) was activated. This study aimed to collect comprehensive observational data on patients admitted to ICUs with COVID-19, to improve our understanding of the natural history of the disease, and to provide contemporary local data concerning ICU outcomes and resource utilisation.

Methods

Study design and setting

SPRINT-SARI Australia is a multi-centre, prospective, observational study of patients with COVID-19 admitted to participating ICUs in Australia. The study design, case report form (CRF) and protocol were developed in conjunction with the International Severe Acute Respiratory and Emerging Infection Consortium (ISARIC)[15]. A standardised CRF, which enabled a rapidly scalable data collection platform for acquiring clinical information and sharing, was developed in response to multiple outbreaks of severe acute respiratory infection over the past 10 years[16]. SPRINT-SARI Australia is supported by the Australian and New Zealand Intensive Care Society Clinical Trials Group (ANZICS CTG), and is coordinated by the Australian and New Zealand Intensive Care Research Centre (ANZIC-RC), Monash University. Participating sites across Australia were identified via the ANZICS CTG, or through previous affiliation with SPRINT-SARI Australia.

Australian ICUs are predominantly staffed by full time specialists. The decision to admit patients to ICU are largely governed by factors such as the likely response to treatment, the likely prognosis, and the long term outcome[17]. Standard nursing ratios of one nurse to one patient (1:1) for an ICU patient and one nurse to two (1:2) for high dependency patients exist in Australian ICUs[18].

Participants

The study population included patients of all ages with a confirmed laboratory polymerase chain reaction (PCR) test for COVID-19 who had an index COVID-19 related admission to a participating

ICU. Patients found to be PCR negative, or whose test was pending at the end of the study period, were excluded. Biological samples for PCR testing could be from the nasopharynx, trachea or lower airways via bronchoscopy, as per local policy[19].

Data collection

Dedicated research staff at each ICU were responsible for screening all admissions for COVID-19 patients. Data from the electronic medical record or paper notes were entered into a database (REDCap, Vanderbilt University) without personal identifiers. The ANZIC-RC maintained the database and performed all analyses[20]. Start-up meetings, detailed data dictionary, and quality checks were completed to ensure data quality and protocol standardisation, and to minimise bias.

Data collected included baseline demographic and clinical characteristics. The Acute Physiology and Chronic Health Evaluation II (APACHE-II) score and the Sequential Organ Failure Assessment (SOFA) score for the first 24 hours were calculated. Data on investigations, ICU treatments and interventions were collected daily until day 28. Outcomes were recorded as death or upon hospital discharge.

To quantify how comprehensive data collection was, we cross referenced SPRINT-SARI Australia admission data with that collected by the Commonwealth of Australia.[14] This indicated 225 patients had been admitted to ICU with COVID-19 up to and including 5 July 2020. To determine maximum site occupancy, we divided the peak number of COVID-19 cases, by the total number of ICU beds at each study site (as reported by the Australian and New Zealand Intensive Care Society Centre for Outcomes and Resource Evaluation[21]), expressed as a proportion.

Statistics

Data were extracted on 28 July 2020 and pertains to ICU admissions reported to SPRINT-SARI Australia between 27 February 2020 and 30 June 2020. The median ICU length of stay (LOS) was computed using Kaplan-Meier survival methods, censoring at the date of the last daily record, for patients without an ICU discharge date. Weibull survival regression analysis was used to assess risk factors for ICU mortality and LOS in survivors.[22] Time to ICU mortality was defined as time from ICU admission to date of death, censoring at either ICU discharge or the date of the last daily record for patients alive and still in ICU. LOS in ICU among survivors was modelled as time from ICU admission to ICU discharge, censoring for both those who died and those still in ICU. Age, sex, APACHE-II and receipt of invasive ventilation were selected for inclusion in the multivariate models *a priori*, being highly clinically relevant. Remaining variables were then selected following a forward stepwise approach judged by the likelihood ratio test, with a 0.05 significance level used for variable removal and 0.01 significance level for variable inclusion. A parametric survival model with a Weibull distribution was fit in order to incorporate ICU site random effects in the analysis[22]. Hazard ratios and p-values were reported. Our analysis included all available data. All proportions were adjusted if data were missing, and the total number of patients contributing data, for all analyses, are provided. We did not impute missing data. All analyses were performed using Stata version 16 (Stata Corp, College Station, Texas, United States of America (USA)) and R statistical software (R Core Team, 2019).

Ethical approval

All the authors reviewed the manuscript and vouch for the accuracy and completeness of the data provided. Human Research Ethics Committee (HREC) approval for data collection, with a waiver of informed consent, was granted via the National Mutual Acceptance (NMA) scheme, through the Alfred (HREC/16/Alfred/59), or by separate applications to individual sites. Research Governance approval

was granted by the Chief Health Officer (CHO) in South Australia and Victoria, and supported by the CHO in Queensland, under legislated public health powers. Individual site Research Governance approvals were granted at all sites where it was required.

Results

From 27 February to 30 June 2020, a total of 77 ICUs participated in SPRINT-SARI Australia, accounting for 1260/1503 (84%) of all public hospital ICU beds[21]. Forty-four sites contributed at least one confirmed COVID-19 patient, while 32 sites had no confirmed cases, and 1 site had not completed data entry. National ICU bed utilisation peaked on 5 April 2020 with 90 patients, with numbers falling to below 25 patients by the beginning of May (Figure 1). Median peak ICU bed occupancy at each hospital was 14% (IQR 9-16, range 4-40) (Supplement Figure 1). The ICU nurse to patient ratio was 1:1 (1766/2270 ICU days,77.80%) or 2:1 (171/2270 ICU days, 7.53%).

A total of 204 patients were included, representing 204/225 (90.7%) of the ICU cases in Australia (Supplement Figure 2)[14]. 140 (68.6%) were males, 64 (31.4%) were female, and the median age was 63 years (IQR 53-72) (Table 1). Most frequently reported comorbidities were obesity 80/204 (39.2%), diabetes 57/204 (27.9%), hypertension requiring angiotensin converting enzyme (ACE) inhibitor or angiotensin receptor blockade (ARB) 49/204 (24.0%) and chronic cardiac disease 40/204 (19.6%), while for 73/204(35.8%) of patients no comorbidities were recorded. The most prevalent symptoms at time of admission to hospital were fever, cough, shortness of breath, fatigue, myalgia and diarrhoea. Median duration from onset of first symptoms to hospital admission was 6 days (IQR 4-9), and from hospital admission to ICU admission was 1 day (IQR 0-3). Median APACHE-II and SOFA scores at 24 hours in ICU were 14 (IQR 10-18) and 6 (IQR 4-10) respectively. For 114/204 (55.9%), infection was acquired through international travel, of whom almost half were cruise ship travellers (55/204, 27.0%). Close contact with a confirmed or probable case of infection was reported by 92/20445.1% (45.1%) of patients and 17/204 (8.3%) identified as a healthcare worker.

Invasive ventilation was provided for 119/204 (58.3%). Compared to non-ventilated patients, they were older (median 68 years; IQR 57-73 vs median 61 years; IQR 46-69), more likely to be obese (52/119, 43.7% vs 28/85, 32.9%,), have diabetes (44/119, 37.0% vs 13/85, 15.3%) and chronic cardiac disease (27/119, 22.7% vs 13/85, 15.3%), but were less likely to have chronic pulmonary disease (7/119, 5.9% vs 9/85, 10.6%) (Table 1).

Once admitted to ICU, 79/204 (38.7%) of patients were commenced on invasive mechanical ventilation on day 1, while 54/204 (26.5%) were supported with high flow oxygen therapy (Figure 2). The proportion of patients that were invasively ventilated increased to 94/113 (83.2%) by the end of the first week. Non-invasive ventilation (NIV) was used in 4/204 (1.9%) of patients on day 1 and 3/113 (2.7%) on day 7. The most common additional interventions were inotropes (111/204, 54.4%), neuromuscular blockade (87/204, 42.6%), prone positioning (56/204, 27.5%), and corticosteroids (58/204, 28.4%), while renal replacement therapy (23/204, 11.3%), and venovenous extracorporeal membrane oxygenation (ECMO) (2/204, 1.0%) were less common. Hydroxychloroquine was used in 32/204 (15.7%) of patients.

Hospital follow-up was complete for 194/204 (95%), with four patients having ongoing care in the ICU, and six in another area of the hospital. The median ICU LOS for invasively ventilated patients was 16 days (IQR 9-28) compared to 3 days (IQR 2-5) in those not requiring invasive mechanical ventilation (Figure 3). Of mechanically ventilated patients, 27/119 (22.7%) stayed in ICU for 30 days

or longer. Mixed-effects survival regression analysis of the number of days in ICU showed that the use of invasive ventilation (hazard ratio (HR) 0.07; 95% confidence interval (CI) 0.04-0.11; p<0.001) and renal replacement therapy (HR 0.44; 95% CI 0.24-0.80; p=0.007) were associated with a lower chance of early ICU discharge among survivors, after controlling for age, sex and APACHE-II (Supplement Tables 1 and 2).

ICU mortality was 30/200 (15.0%; 95% CI 10.4-20.7). In those patients requiring invasive ventilation, mortality was 26/117 (22.2%; 95% CI 15.1-30.8), compared to 4/83 (4.8%; 95% CI 1.3-11.9) in those that were not. All but 2 of the deaths were in patients 60 years and over (Figure 4). Table 2 shows the univariate factors associated with ICU mortality; older age (over 64), chronic cardiac, pulmonary and kidney disease were associated with ICU mortality. When controlling for other factors (age, sex and invasive ventilation) initial severity of illness scored using APACHE-II (HR 1.15; 95% CI 1.09-1.21; p<0.001) and chronic cardiac disease (HR 3.38; 95% CI 1.46-7.83; p=0.004) were associated with ICU mortality (Table 3).

Discussion

In this first report of Australian patients admitted to ICUs during the early phase of the COVID-19 pandemic, we found invasively ventilated patients had an ICU mortality of 22.2%, considerably lower than rates reported internationally, and despite a higher proportion of patients with complete outcomes. We also found that median ICU LOS was longer, with 22.7% of patients staying 30 days or longer.

Several factors may account for this difference. Reports from many European countries, the USA, and parts of China showed the numbers of COVID-19 patients increased rapidly allowing little preparation, quickly exceeding their health care capacity[2,11,12,23]. The numbers of patients invasively ventilated on day 1 of their ICU admission in these countries were very high (70-90%). In our study, even at a peak of 90 patients, overall COVID-19 numbers remained low, and only 79/204 (38.7%) of ICU cases were ventilated in the first 24 hours (Figure 2). Moreover, patients were distributed across a large number of institutions, and the maximum number of COVID-19 patients at any one site (as a proportion of their total ICU beds), remained low (median 14% IQR 9-16) (Supplement Figure 1).

As the healthcare system in Australia never reached, let alone exceeded capacity during this period, it may be that in these circumstances, patients could access the ICU earlier in the course of their illness, thereby benefiting from interventions that have been associated with lower mortality rates[24,25]. In a study from China, the rapid escalation of infections around the Wuhan epicentre was associated with increased mortality rates, when compared to other parts of China where the infection rate was slower[26].

The second potential reason is that our study cohort differs from that of other countries in several key ways. First, the source of infection was most commonly from international travel (114/204, 55.9%), compared to locally acquired infection in many other countries[1,11]. This 'travelling' population may be 'healthier' compared to cases due to community spread, where patients, such as those in long term care facilities, have been infected[1]. The median age of our cohort (63 years; IQR 53-72) was similar to ICU cohorts reported from the USA (64 years)[12] and Italy (63 years)[2], but younger than the UK (73 years)[11] population. In addition, our cohort had fewer comorbidities, the number of which has been shown to increase the risk of ICU admission, the need for mechanical ventilation or death[27].

We also found the ICU LOS of invasively ventilated patients was prolonged (median 16 days; IQR 9-28) compared to studies from the UK (9.7 days)[11] and USA (12 days)[12]. While the use of other ICU

supports, including rates of proning (28-40%), neuromuscular blockade (39%), renal replacement therapy (20%) and ECMO (0-3%) was similar to our findings, it is plausible that the prolonged duration of support in Australian ICUs was only possible because the system had capacity to provide it. This very long, resource-intense period of treatment has important implications for ongoing service provision and planning. The natural history of COVID-19 in Australian ICUs during this early phase appeared to be a resource heavy, protracted admission with a low mortality rate. Given the recent increase in COVID-19 cases, it remains to be seen whether this will persist, particularly with changes in epidemiology due to wider community transmission. Of note, our data implies a substantial resource burden in caring for these patients that, if not met, may also impact outcomes.[27]

Strengths and limitations

This study had comprehensive coverage of ICUs in Australia, providing unique, nationally representative data in a health care system operating within its capacity. The data were collected using a standardised CRF, with experienced data collectors, and included daily data fields for the first 28 days. The long duration of follow-up was complemented with near complete outcome data. The limitations include the observational nature of the study, with inevitable confounding among therapeutic factors associated with mortality and other characteristics.

We did not collect data on COVID-19 patients who were not admitted to the ICU, and as such, our study does not explore the complex decision making process around ICU admission. While this may limit the generalisability of our findings, we chose a pragmatic approach, so as to rapidly collect, analyse, and report data on the interventions and outcomes of confirmed COVID-19 cases admitted to ICU in Australia. In addition, as this study focussed primarily on ICU interventions, treatments provided prior to ICU admission were not included in analysis, and may have impacted the primary outcome. Finally, the COVID-19 pandemic is ongoing in Australia, and it is uncertain whether these data will be representative of future cohorts.

Conclusion

During the early phase of the pandemic in Australia, patients admitted to ICU with COVID-19 had lower mortality and longer length of stay than reported from other regions. These findings reinforce the importance of ensuring adequate local ICU capacity, particularly given the recent increase in COVID-19 cases.

Text Word Count: 2635

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Tables

Table 1. Characteristics of intensive care unit patients with confirmed COVID-19

	WITH Invasive Ventilation	WITHOUT Invasive Ventilation	TOTAL
N	119	85	204
Age (years), median (IQR[a])	68.0 (57.0, 73.0)	61.0 (46.0, 69.0)	63.5 (53.0, 72.0)
Age group: 2 months-54 years	22 (18.5%)	33 (38.8%)	55 (27.0%)
Age group: 55-64 years	27 (22.7%)	23 (27.1%)	50 (24.5%)
Age group: 65-85 years	70 (58.8%)	29 (34.1%)	99 (48.5%)
Sex: Female	37 (31.1%)	27 (31.8%)	64 (31.4%)
Sex: Male	82 (68.9%)	58 (68.2%)	140 (68.6%)
BMI[b] (kg/m2), median (IQR[a])	29.7 (24.8, 33.3)	28.5 (23.6, 32.1)	28.8 (24.6, 32.3)
BMI[b] class: Underweight	1 (0.8%)	1 (1.2%)	2 (1.0%)
BMI[b] class: Normal weight	28 (23.7%)	24 (28.9%)	52 (25.9%)
BMI[b] class: Overweight	30 (25.4%)	21 (25.3%)	51 (25.4%)
BMI[b] class: Obese	52 (44.1%)	28 (33.7%)	80 (39.8%)
BMI[b] class: Not stated	7 (5.9%)	9 (10.8%)	16 (8.0%)
Smoking status: Smoking history	20 (16.8%)	7 (8.2%)	27 (13.2%)
Smoking status: Non-smoker	94 (79.0%)	75 (88.2%)	169 (82.8%)
Smoking status: Not stated	5 (4.2%)	3 (3.5%)	8 (3.9%)
APACHE-II on Day 1, median (IQR[a])	17.0 (14.0, 19.0)	10.0 (6.0, 13.0)	14.0 (10.0, 18.0)
SOFA Score on Day 1			
N (with all components for computation)	65	33	98
Median (IQR)	8 (6, 11)	4 (3, 6)	6 (4, 10)
Comorbidities reported:			
Diabetes	44 (37.0%)	13 (15.3%)	57 (27.9%)
Asthma	12 (10.1%)	10 (11.8%)	22 (10.8%)
ACE inhibitor/A2 Blocker	29 (24.4%)	20 (23.5%)	49 (24.0%)
Chronic cardiac disease	27 (22.7%)	13 (15.3%)	40 (19.6%)
Chronic pulmonary disease	7 (5.9%)	9 (10.6%)	16 (7.8%)
Chronic kidney disease	8 (6.7%)	3 (3.5%)	11 (5.4%)
Liver disease	2 (1.7%)	3 (3.5%)	5 (2.5%)
Chronic hematologic disease	7 (5.9%)	2 (2.4%)	9 (4.4%)
Chronic immunosuppression	7 (5.9%)	6 (7.1%)	13 (6.4%)
No comorbidities reported	37 (31.1%)	36 (42.4%)	73 (35.8%)
Returning international traveller	60 (50.4%)	54 (63.5%)	114 (55.9%)
Cruise ship traveller	28 (23.5%)	27 (31.8%)	55 (27.0%)
Health care worker	8 (6.7%)	9 (10.6%)	17 (8.3%)
Days from first symptom onset to hospital admission:			
N (with both dates reported)	103	82	185
Median (IQR)	6 (3, 9)	6 (3, 9)	6 (3, 9)

Days from first symptom onset to ICU admission:			
N (with both dates reported)	105	82	187
Median (IQR)	8 (5, 11)	8 (5, 11)	8 (5, 11)
Days from hospital admission to ICU admission:			
N (with both dates reported)	119	85	204
Median (IQR)	1 (0, 3)	0 (0, 2)	1 (0, 3)

Abbreviations: A2 blocker, Alpha-2 blocker; ACE inhibitors, Angiotensin-converting enzyme (ACE) inhibitors; APACHE-II, Acute Physiology And Chronic Health Evaluation II; BMI, body mass index; IQR, interquartile range; SOFA, sequential organ failure assessment.

[a] The interquartile range presented as 25^{th} and 75^{th} percentiles.

[b] Body mass index is the weight in kilograms divided by the square of height in metres. BMI is classified as underweight (<18.5), normal weight (18.5-24.9), overweight (25-29.9) and obese (≥30). This is calculated for individuals aged 18 years and over.

Table 2. Univariate survival regression analysis of intensive care unit COVID-19 mortality

Covariate	Hazard Ratio (95% CI)	p-value
Age group: 2 months-54 years	Reference	
Age group: 55-64 years	3 (0.33, 27)	0.326
Age group: 65-85 years	9.03 (1.22, 66.91)	0.031
Sex: Female	Reference	
Sex: Male	1.02 (0.46, 2.3)	0.954
Smoking status: Non-smoker	Reference	
Smoking status: Smoking history	1.42 (0.58, 3.5)	0.447
Smoking status: Not stated	3.05 (0.71, 13.07)	0.133
BMI[a]: Underweight	-	
BMI[a]: Normal weight	Reference	
BMI[a]: Overweight	0.40 (0.15, 1.07)	0.069
BMI[a]: Obese	0.32 (0.13, 0.79)	0.014
BMI[a]: Not stated	2.40 (0.82, 7.03)	0.112
Returned traveller	0.69 (0.34, 1.42)	0.320
Cruise ship traveller	0.76 (0.33, 1.78)	0.533
Health care worker	0.76 (0.18, 3.19)	0.706
SOFA at day 1: Respiratory	1.46 (0.87, 2.45)	0.153
SOFA at day 1: Cardiovascular	1.10 (0.86, 1.39)	0.450
APACHE-II at day 1	1.16 (1.11, 1.22)	<0.001
Diabetes	1.30 (0.62, 2.70)	0.485
Asthma	0.79 (0.24, 2.60)	0.696
ACE inhibitor/A2 Blocker	1.28 (0.57, 2.88)	0.552
Chronic cardiac disease	4.11 (1.99, 8.51)	<0.001
Chronic pulmonary disease	6.57 (2.60, 16.56)	<0.001
Chronic kidney disease	3.60 (1.38, 9.42)	0.009
Liver disease	2.30 (0.31, 17.11)	0.415
Chronic haematological disease	2.44 (0.74, 8.04)	0.143
Chronic immunosuppression	2.77 (0.97, 7.94)	0.058
Invasive ventilation	1.06 (0.34, 3.32)	0.921
Inotropic/vasopressor support	1.18 (0.47, 2.97)	0.727
Prone positioning	1.47 (0.71, 3.06)	0.301
Renal replacement therapy	1.38 (0.61, 3.14)	0.444
Neuromuscular blocking agents	0.99 (0.45, 2.17)	0.974
Corticosteroid	1.36 (0.66, 2.81)	0.400

Abbreviations: A2 blocker, Alpha-2 blocker; ACE inhibitors, Angiotensin-converting enzyme (ACE) inhibitors; APACHE-II, Acute Physiology And Chronic Health Evaluation II; BMI, body mass index; CI, confidence interval; SOFA, sequential organ failure assessment.

[a] Body mass index is the weight in kilograms divided by the square of height in metres. BMI is classified as underweight (<18.5), normal weight (18.5-24.9), overweight (25-29.9) and obese (≥30). This is calculated for individuals aged 18 years and over.

Table 3. Multivariate mixed-effects survival regression analysis of intensive care unit COVID-19 mortality

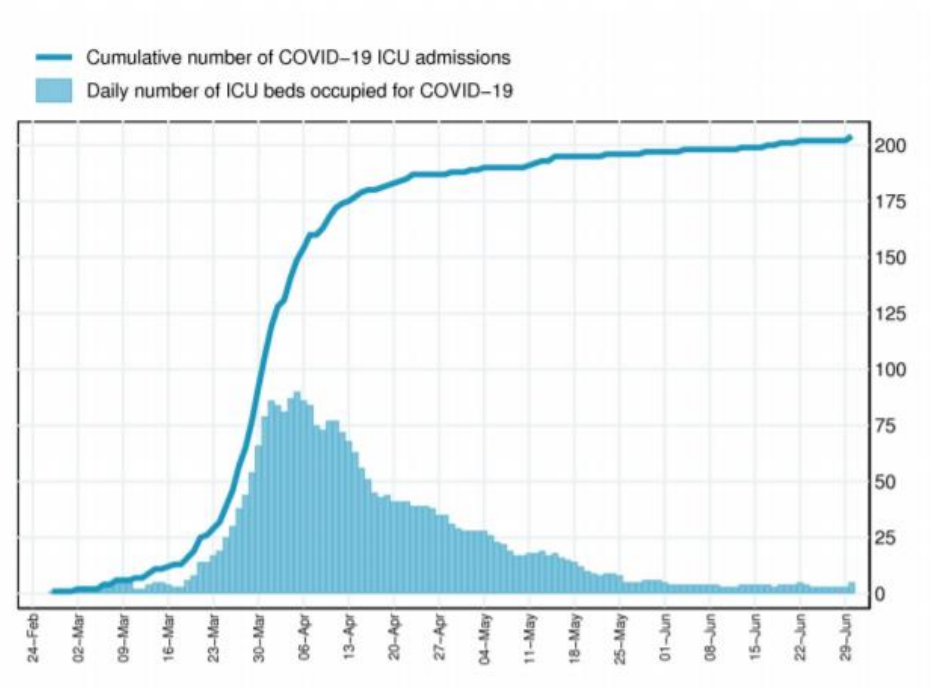
Covariate	Hazard Ratio (95% CI)	p-value
Age group: 2 months-54 years	Reference	
Age group: 55-64 years	0.88 (0.09, 8.39)	0.911
Age group: 65-85 years	2.77 (0.36, 21.62)	0.330
Sex: Female	Reference	
Sex: Male	0.85 (0.35, 2.04)	0.711
APACHE-II at day 1	1.15 (1.09, 1.21)	<0.001
Invasive ventilation	0.42 (0.11, 1.58)	0.199
Chronic cardiac disease	3.38 (1.46, 7.83)	0.004

N=195

Abbreviations: APACHE-II, Acute Physiology And Chronic Health Evaluation II; CI, confidence interval.

Figures

Figure 1. Cumulative admissions and daily number of intensive care beds occupied by patients with confirmed COVID-19

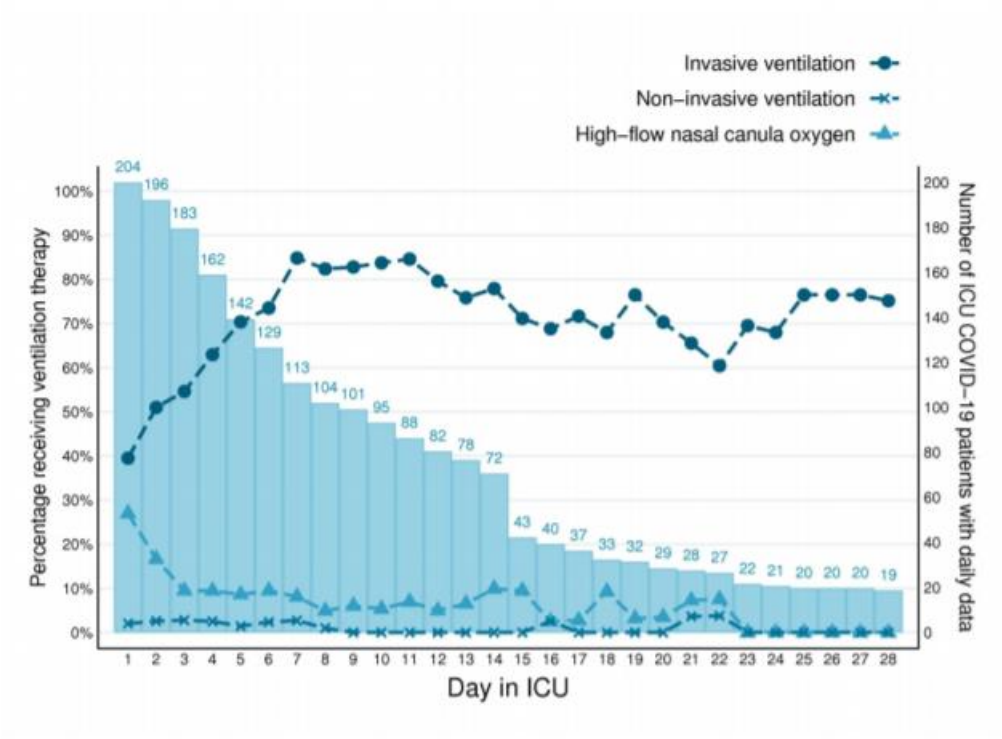


Cumulative admissions and daily number of intensive care beds occupied by patients with confirmed COVID-19

139x101mm (600 x 600 DPI)

Figure 1 Footnote:
Abbreviations: ICU, Intensive Care Unit
Includes 204 confirmed COVID-19 ICU admissions from 27 Feb to 30 Jun, 2020. Daily number of ICU beds has been calculated based on ICU admission dates and ICU discharge dates. If ICU discharge date is not recorded it is assumed that patient still occupies an ICU bed.

Figure 2. Daily proportion of patients undergoing respiratory support while in intensive care

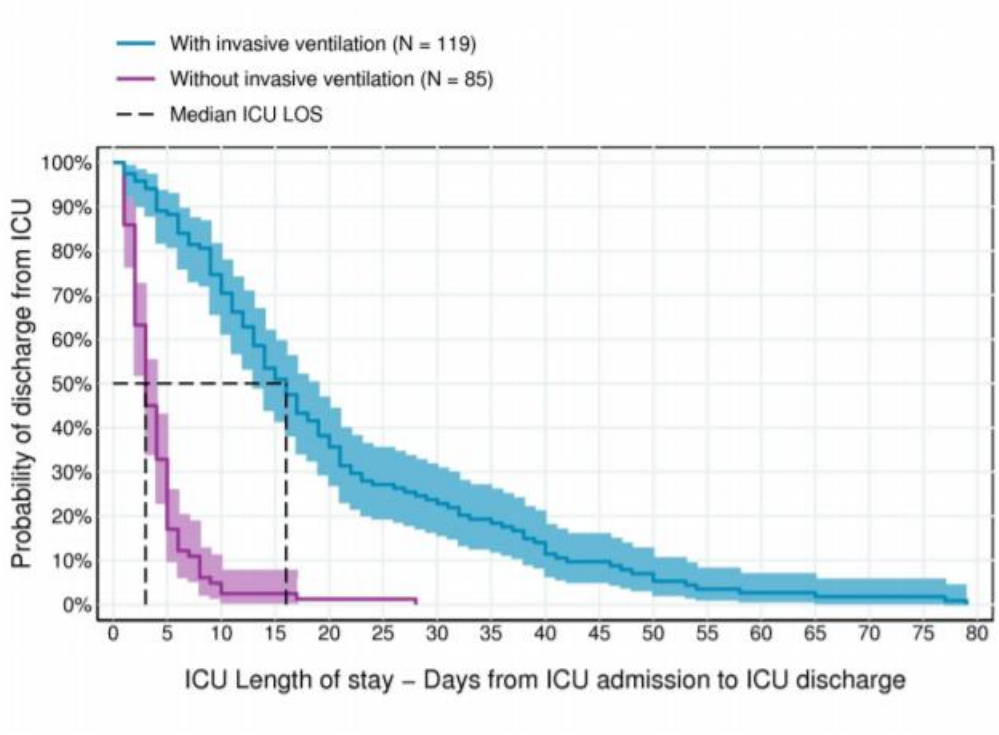


Daily proportion of patients undergoing respiratory support while in intensive care

139x101mm (600 x 600 DPI)

Figure 2 Footnote:
Abbreviations: ICU, Intensive Care Unit

Figure 3. Length of stay in intensive care, by ventilation status

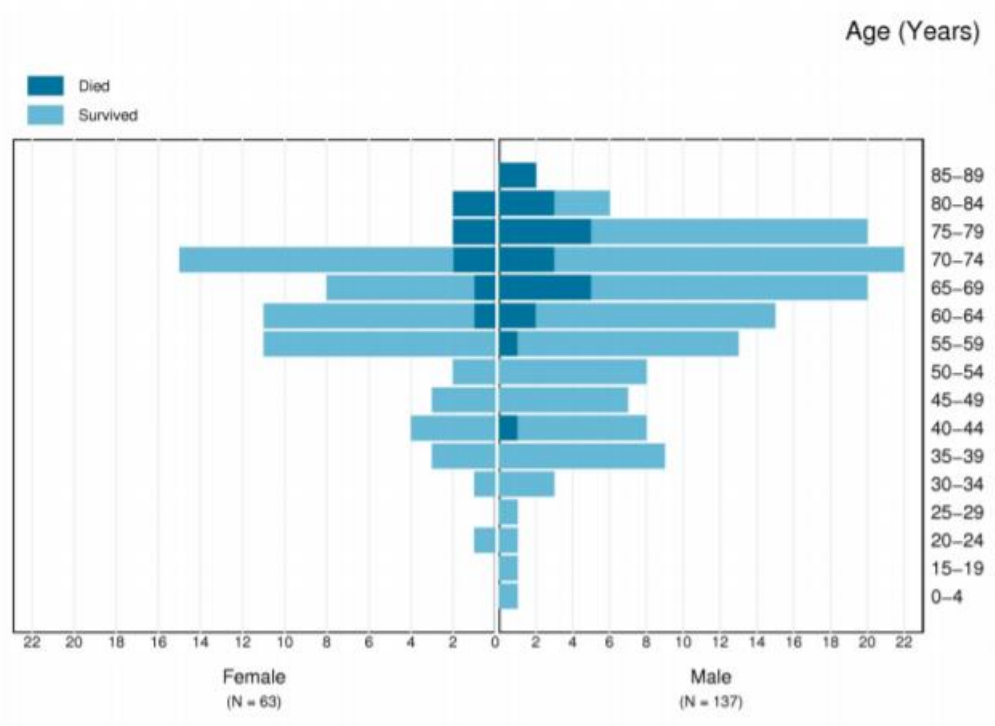


Length of stay in intensive care, by ventilation status

139x101mm (600 x 600 DPI)

Figure 3 Footnote:
Abbreviations: ICU, Intensive Care Unit; LOS, Length of Stay; IQR, Interquartile Range
ICU LOS was defined as the time between ICU admission and ICU discharge dates for all discharged (alive and dead). Patients with a date of discharge from ICU not yet reported were censored. Median LOS in ICU was 16 days (IQR 9-28) for patients with invasive ventilation and 3 days (IQR 2-5) for patients without invasive ventilation. Log-rank test: $p < 0.001$.

Figure 4. Age and sex distribution by patient outcome



Age and sex distribution by patient outcome

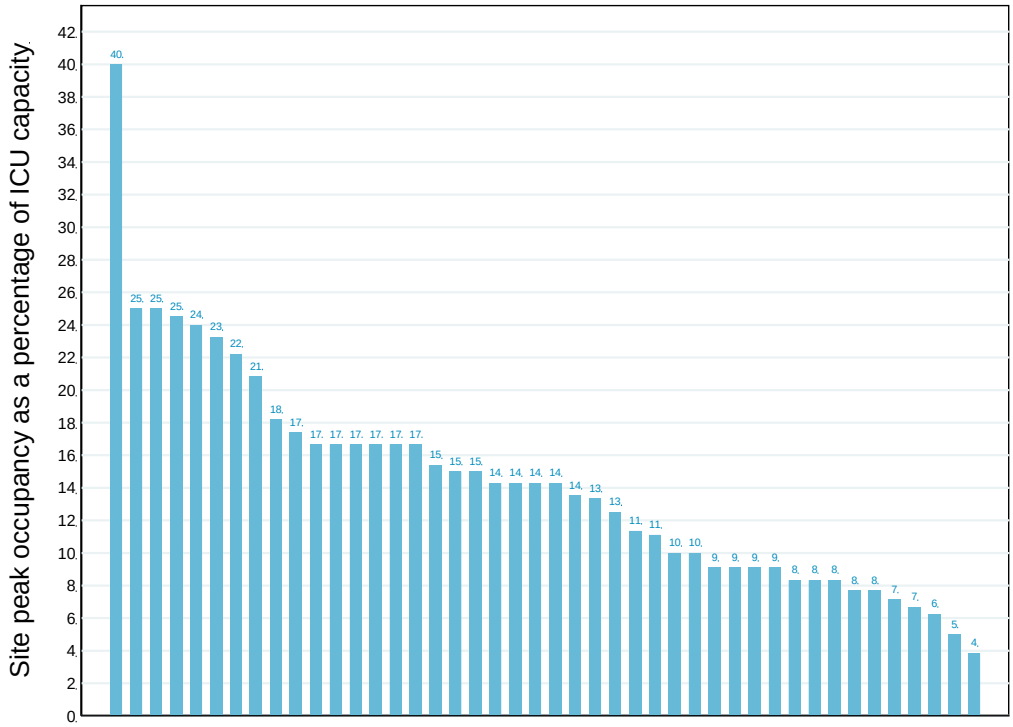
139x101mm (600 x 600 DPI)

Figure 4 Footnote:
Excludes four patients not yet discharged from Intensive Care Unit.

Supplemental Appendix

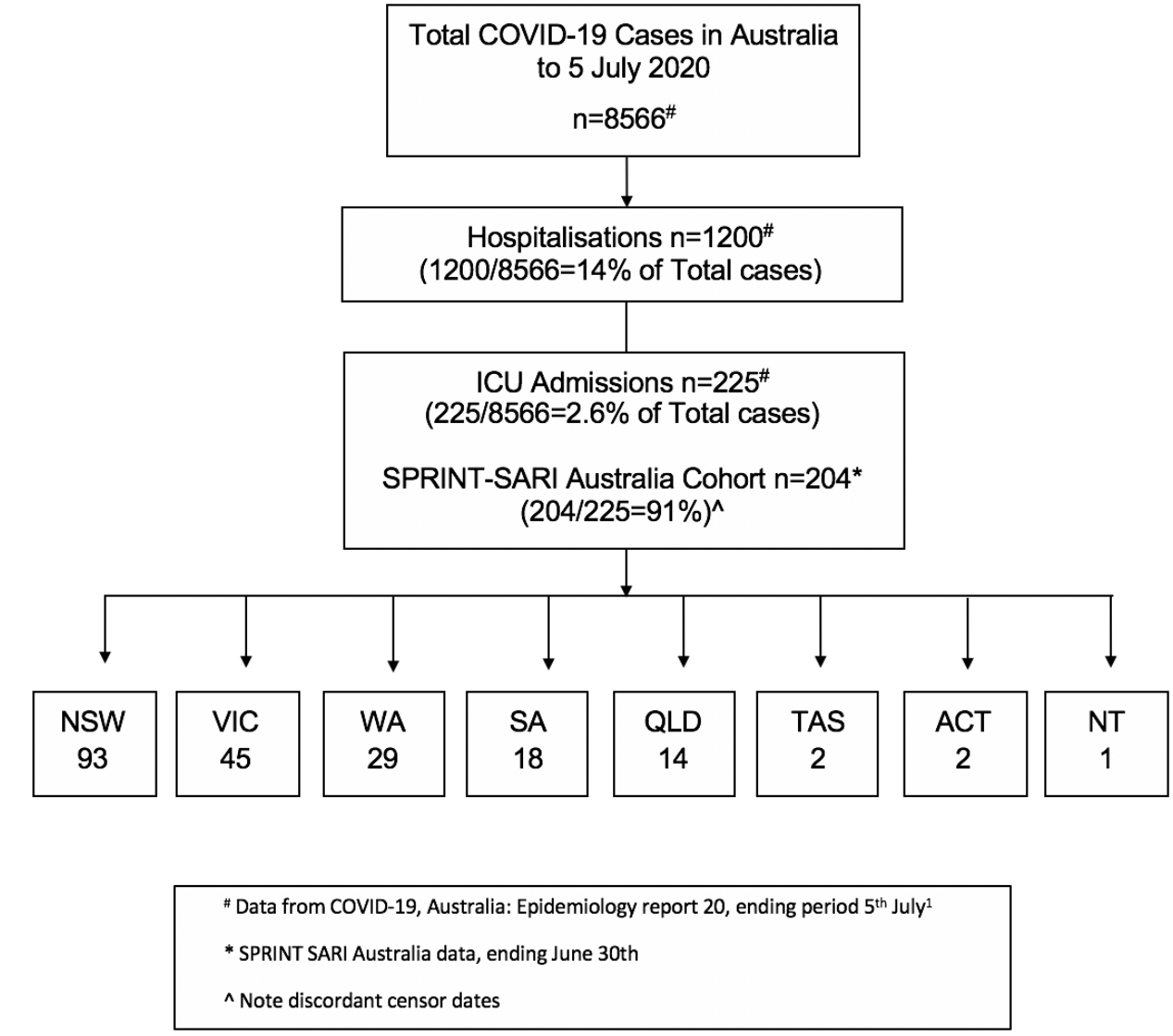
Outcomes of COVID-19 Patients Admitted to Australian Intensive Care Units during the Early Phase of the Pandemic

Supplement Figure 1. Site peak occupancy as a percentage of intensive care unit capacity



Abbreviations: ICU, Intensive Care Unit

Supplement Figure 2. SPRINT-SARI Australia STROBE Consort Diagram



Abbreviations: ACT, Australian Capital Territory; NSW, New South Wales; NT, Northern Territory; QLD, Queensland; SA, South Australia; SPRINT-SARI, Short PeRiod IncideNce sTudy of Severe Acute Respiratory Infection; TAS, Tasmania; VIC, Victoria; WA, Western Australia.

Supplement Table 1. Univariate survival regression analysis of intensive care unit length of stay among survivors

Covariate	Hazard Ratio (95% CI)	p-value
Age group: 2 months-54 years	Reference	
Age group: 55-64 years	0.61 (0.41, 0.92)	0.017
Age group: 65-85 years	0.47 (0.33, 0.67)	<0.001
Sex: Female	Reference	
Sex: Male	0.77 (0.56, 1.06)	0.105
Smoking status: Non-smoker	Reference	
Smoking status: Smoking history	0.76 (0.48, 1.2)	0.232
Smoking status: Not stated	1.47 (0.65, 3.33)	0.360
BMI[a]: Underweight	-	
BMI[a]: Normal weight	Reference	
BMI[a]: Overweight	0.84 (0.54, 1.28)	0.414
BMI[a]: Obese	0.79 (0.53, 1.17)	0.234
BMI[a]: Not stated	1.77 (0.94, 3.34)	0.077
Returned traveller	1.08 (0.80, 1.47)	0.611
Cruise ship traveller	0.98 (0.70, 1.37)	0.902
Health care worker	1.02 (0.60, 1.74)	0.930
SOFA at day 1: Respiratory	0.88 (0.73, 1.06)	0.177
SOFA at day 1: Cardiovascular	0.83 (0.74, 0.94)	0.003
APACHE-II at day 1	0.91 (0.89, 0.94)	<0.001
Diabetes	0.67 (0.48, 0.95)	0.022
Asthma	0.88 (0.54, 1.41)	0.590
ACE inhibitor/A2 Blocker	1.14 (0.80, 1.61)	0.480
Chronic cardiac disease	1.02 (0.68, 1.55)	0.913
Chronic pulmonary disease	1.47 (0.75, 2.90)	0.263
Chronic kidney disease	0.66 (0.29, 1.50)	0.325
Liver disease	1.71 (0.63, 4.62)	0.294
Chronic haematological disease	0.80 (0.35, 1.81)	0.592
Chronic immunosuppression	1.02 (0.52, 1.99)	0.965
Invasive ventilation	0.08 (0.06, 0.12)	<0.001
Inotropic/vasopressor support	0.25 (0.18, 0.34)	<0.001
Prone positioning	0.35 (0.25, 0.51)	<0.001
Renal replacement therapy	0.34 (0.20, 0.58)	<0.001
Neuromuscular blocking agents	0.27 (0.19, 0.37)	<0.001
Corticosteroid	0.51 (0.36, 0.72)	<0.001

Abbreviations: A2 blocker, Alpha-2 blocker; ACE inhibitors, Angiotensin-converting enzyme (ACE) inhibitors; APACHE-II, Acute Physiology And Chronic Health Evaluation II; BMI, body mass index; IQR, interquartile range; SOFA, sequential organ failure assessment.

[a] Body mass index is the weight in kilograms divided by the square of height in metres. BMI is classified as underweight (<18.5), normal weight (18.5-24.9), overweight (25-29.9) and obese (≥30). This is calculated for individuals aged 18 years and over.

Supplement Table 2. Multivariate mixed-effects survival analysis of intensive care unit length of stay among survivors

Covariate	Hazard Ratio (95% CI)	p-value
Age group: 2 months-54 years	Reference	
Age group: 55-64 years	0.66 (0.40, 1.08)	0.097
Age group: 65-85 years	0.74 (0.47, 1.17)	0.197
Sex: Female	Reference	
Sex: Male	0.75 (0.51, 1.09)	0.135
APACHE-II at day 1	0.99 (0.95, 1.03)	0.543
Invasive ventilation	0.07 (0.04, 0.11)	<0.001
Renal replacement therapy	0.44 (0.24, 0.80)	0.007

N=195

Abbreviations: APACHE-II, Acute Physiology And Chronic Health Evaluation II; CI, confidence interval.

References

1. Covid-National Incident Room Surveillance Team. COVID-19, Australia: Epidemiology Report 16 (Reporting week to 23:59 AEST 17 May 2020). Commun Dis Intell (2018) 2020;44 (doi: 10.33321/cdi.2020.44.45).

Redcap Instrument name = Inclusion Criteria			
	Number	**Field Label**	**Instructions and Notes**
N/A			
	Nil	Participant Identification Number (PIN):	Enter your 3 digit ANZIC RC hospital Identifier Followed by a "-" and then the patient number (ie. 0001) I.e. XXX-0001
INCLUSION CRITERIA			
	1	Suspected or proven acute novel Coronavirus (nCoV) infection:	Answer Yes to this section if the patient fits any of the three categories Suspected = High Clinical Suspicion Proven = +ve PCR
		Choose from the following:	**Clinical suspicion of COVID-19/ Negative Swab/ Being managed as COVID-19** Despite - ve swap for COVID -19. Clinician continues to manage the patient as a COVID -19 because they have a high clinical suspicion. Clinical suspicion may be Respiratory Failure or Cardiovascular failure of suspected COVID-19 origin

			Clinical suspicion of COVID-19/ Awaiting Swab/ Being managed as COVID-19 Clinician managing the patient as a COVID -19 because they have a high clinical suspicion. Clinician is awaiting swab result Clinical suspicion may be Respiratory Failure or Cardiovascular failure of suspected COVID-19 origin
			Proven COVID-19 Clinician has received a +ve PCR for this patient and patient is being managed as COVID-19
EPIDEMIOLOGICAL FACTORS - In the 14 days before onset of illness had any of the following:			
	2	History of travel to an area with documented cases of novel coronavirus infection. If YES, complete 2.1 - Country	Has the patient in the last 14 days (prior to onset of illness) returned from travel OS. This includes travelling on a cruise Ship
	3	Close contact* with a confirmed or probable case of nCoV infection, while that patient was symptomatic	Has the patient in the last 14 days (prior to onset of Illness) been in contact or likely to have been in contact with a patient that was symptomatic with COVID-19 *** Close contact' is defined as:** - Health care associated exposure, including providing direct care for novel coronavirus patients, e.g. health care worker, working with health care workers infected with novel coronavirus, visiting patients or staying in the same close environment of a novel coronavirus patient, or direct exposure to body fluids or specimens including aerosols. - Working together in close proximity or sharing the same classroom environment with a novel coronavirus patient. - Traveling together with novel coronavirus patient in any kind of conveyance. - Living in the same household as a novel coronavirus patient.

	4	Presence in a healthcare facility where nCoV infections have been managed	Has the patient in the last 14 days (prior to onset of Illness) visited a Healthcare facility where COVID-19 has been managed
	5	Presence in a laboratory handling suspected or confirmed nCoV samples	Has the patient in the last 14 days (prior to onset of Illness) visited a laboratory where COVID-19 samples are stored
Links to Question 2 (History of travel to an area with documented cases of novel coronavirus infection. If YES, complete 2.1 - Country)			
	2.1	If YES, state location: Country	Which Country was the person in which gave them the highest risk give symptom timing. Cruise ship is available as an option
	2.2	If YES, state location: City/Geographic Area:	Enter the city or region they spent most of their time in - If known
	2.3	If YES, return date:	Which date they return / Disembark in Australia

Redcap Instrument name = Demographics (Part 1)			
Section Header	**Number**	**Field Label**	**Instructions and Notes**
Demographics			
	1.1	Ethnic group (check all that apply)	Choose the ethnic group that best fits the patients construct of themselves. Generally this relates to the Genetic Heritage Utilise "Other" to further describe If the patient's ethnicity is not known, please place a cross (X) in the 'Unknown' box.
		If Other: Specify	Use this space to further define 1.1 or to give clarity to your response
	1.2	Employed as a healthcare worker or any of the following professions?	Is the patient currently employed as a health worker or in any of the following professions listed
	1.2a	If Other, Specify:	Use this space to further define 1.2 or to give clarity to your response

		Is the patient living in a group residential setting?	Is the patient currently living in a group residential setting in any of the categories listed
		If Other, Specify:	Use this space to further define or give clarity to your response
	1.3	Sex at birth:	Choose the birth gender or If patient does not wish to be reflected in a binary manner choose Not specified
	1.4	Age/Estimated age	Estimated age at time of this Hospital admission (Years) If the patient is <1-year-old enter value in Months. If child is 1 year old - please enter 12 months
		Age/Estimated age Unit	Enter the unit the age is in Months for children <1-year-old Years for all others
	1.5	Pregnant?	Is the patient Pregnant at the time of COVID admission

		If YES: Gestational weeks assessment:	Enter the approximate gestational age
	1.6	Post-partum	Answer yes to this question if the patient delivered a child within the last 6 weeks
	1.6.1	Pregnancy outcome	Answer if the patient gave birth in the last 6 weeks Live birth is defined as the complete expulsion or extraction from the mother of a baby, Stillbirth dead foetus ≥22 weeks gestational or birth weight of 500 grams or more (if foetal gestational age is not known).
	1.6.2	Delivery date	If the patient is post-partum enter the date on which the baby was delivered, in day/month/year format (DD/MM/YYYY).
	1.6.3	Baby tested for mother's ARI infection	Answer Yes if the baby has been tested for COVID
		If YES, testing outcome	Answer Positive if the Baby tested Positive to COVID-19 Answer Negative if the Baby tested Negative to COVID-19
	1.6.4	Method	Was test done using Polymerase Chain Reaction (PCR)
		If OTHER method; Specify	Please define other type of test done. If more than one test performed leave this blank
	1.7	INFANT - Less than 1 year old?	Is child less than or equal to 12 months answer "YES"
	1.7.1	Birth weight	

		Birth weight unit	Choose appropriate Unit (either Kilograms or lbs
	1.7.2	Gestational outcome	Choose closest Gestational age if Known
	1.7.3	Breastfed	Was child Breastfed by mother ever Yes No Not applicable
		If YES	Is the child Currently being Brest Fed
		Discontinued breastfeeding at	How many weeks POST partum did Breast feeding stop How many weeks was the Baby breastfed
	1.7.4	Appropriate development for age?	Is the child developing appropriate to their age
	1.7.5	Vaccinations appropriate for age/country?	Has the Child received all Recommended Vaccinations for their age
ONSET and ADMISSION			

	2.1	Onset date of first/earliest symptom	The date on which the symptoms associated with the patient's current presentation of confirmed or suspected nCoV infection began or were first noted. Please avoid including symptoms that are chronic and/or only related to an underlying condition, unless the suspected/confirmed nCoV illness began with worsening of chronic symptoms (where this is the case, enter the date when the worsening of chronic symptoms began). When multiple symptoms, enter date of the earliest symptom. For example, if patient reported fever followed by cough and shortness of breath, enter the date fever started. If patient reported sore throat followed by cough and then fever, enter the date the sore throat started.
	2.2	Admission date and time at this hospital	Enter the date the patient was admitted to this facility format (DD/MM/YYYY). Enter the time at which the patient was admitted to this facility format of hour/minute (HH/MM) 24 hour format
	2.3	2.3 Was the patient admitted into ICU?	Was the patient admitted to an ICU. ICU can be any area functioning as an ICU environment. In AUS this will generally mean a 1:1 patient to nurse ratio + managed and/or supported by ICU Medical team
	2.4	2.4 Admission date and time at ICU	Enter the date the patient was admitted ICU format (DD/MM/YYYY). Enter the time at which the patient was admitted to ICU format of hour/minute (HH/MM) 24 hour format
	2.5	In this hospital admission, was the patient previously in ICU?	Select yes, if the patient was previously in ICU for either COVID-19 treatment or any other treatment during this hospital admission.

	2.5.1	If yes, was the patient in ICU due to COVID-19?	Select yes if the patient's previous admission to ICU was also due to COVID-19 suspicion or confirmed infection. Select no if the previous ICU admission was for another reason.
	2.5.2	If yes, what was the patient's participant ID? write "Not applicable" if patient wasn't enrolled before	If the patient has been admitted to the ICU twice for COVID-19 infection and enrolled in SPRINT-SARI both times, enter their previous participant ID here.
	2.6	Transfer from other facility?	Was the patient transferred from another facility to your Acute hospital answer yes if they came from any other medical facility
	2.6.1	If YES: Name of transfer facility:	If the patient was transferred from another facility (hospital), please enter the name of the facility.
	2.6.2	If YES: Admission date at transfer facility	If the patient was transferred from another facility (hospital), please enter the date the patient was admitted to the other facility (DD/MM/YYYY) format. If the date of admission to the other facility is not known, please place a cross (X) in the appropriate box.
	2.6.3	If YES - Study Site: Participant ID # at transfer facility	
		If DIFFERENT; Participant number	If the patient was in an ICU at the other facility and did receive a SPRINT SARI Study number please write that here

	2.7	Was patient originally admitted to first hospital for COVID related illness	Select 'yes' if patient was admitted to the first hospital for COVID related illness and 'no' if patient was admitted to the first hospital for other reason.

Redcap Instrument name = Demographics (Part 2)			
Section Header	**Number**	**Field Label**	**Instructions and Notes**
3. HOSPITAL ADMISSION SIGNS AND SYMPTOMS (observed/reported at hospital admission and associated with this episode of acute illness). If patient contracted COVID while in hospital, what were the first signs and symptoms.			
	3.01	History of fever	Fever of ≥ 38 C measured in any way
	3.02	Cough	Cough
	3.02.1	Cough: with sputum production	Cough with sputum
	3.02.2	Cough: bloody sputum / haemoptysis	Cough with Blood dots or Frank blood
	3.03	Sore throat	Sore throat
	3.04	Runny nose (Rhinorrhoea)	Complained of "runny nose"
	3.05	Ear pain	Presense of ear pain
	3.06	Wheezing	Is a continuous, coarse, whistling sound produced in the respiratory airways during breathing. Usually during expiration
	3.07	Chest pain	Presence of chest pain

	3.08	Muscle aches (Myalgia)	Aching of muscles
	3.09	Joint pain (Arthralgia)	Presence of joint pain - one or many
	3.10	Fatigue / Malaise	A change in the level of Fatigue that the patient is experiencing Can be acute (come on suddenly) or chronic.
	3.11	Shortness of breath (Dyspnea)	A change in the level of difficulty or labour of breathing that is out of proportion to the patient's level of physical activity. In children, Rapid breathing, slow breathing for age, and/or apnoea (> 20 sec or < 20 sec with pallor, cyanosis)
	3.12	Lower chest wall indrawing	Defined as when the lower chest wall goes in when the patient breathes in; if only the soft tissue between the ribs or above the clavicle goes in when the patient breathes, this is not lower chest wall in-drawing.
	3.13	Headache	Patient has complained of headache
	3.14	Altered consciousness / confusion	A change in the normal state of consciousness or awareness
	3.15	Seizures	This may include physical convulsion, minor physical signs, thought disturbances, or a combination of symptoms.
	3.16	Abdominal pain	Presence of abdominal pain
	3.17	Vomiting / Nausea	Presence of vomiting or a feeling of urge to vomit
	3.18	Diarrhoea	Defined as three or more loose or liquid bowel movements per day.
	3.19	Conjunctivitis	Inflammation of the membrane covering the surface of the eyeball.
	3.20	Skin rash	Presence of skin rash

	3.21	Skin ulcers	Presence of skin ulcers
	3.22	Lymphadenopathy	Abnormal enlarged lymph nodes
	3.23	Bleeding (Haemorrhage)	New and uncontrolled bleeding of an unknown reason
	3.24	If Bleeding (others)	If bleeding in more than one place
	3.25	Loss of smell/taste	Loss of either Smell or Taste for the patient
	3.26	Rigor or sweating	Sweating and / or shivering uncontrollably
		If Yes, specify site(s)	Site of major bleeding
Admission Signs and Symptoms (worst available data within 24 hours of admission)			
		Temperature (worst highest)	In the first 24 hours what was the worst Temperature
		Temperature Units	Units for temperature reading
		Heart Rate (highest)	Highest Heart rate in the first 24 hrs after admission beats per minute
		Respiratory Rate (highest pre-intubation)	First 24 hours highest (pre-intubation) breaths per minute
		Systolic blood pressure (worst)	IN the first 24 hours after admission what was the highest Systolic Blood Pressure mmHg

		Diastolic blood pressure (Lowest)	IN the first 24 hours after admission what was the lowest Diastolic Blood Pressure (mmHg)
		Severe dehydration: (In clinicians opinion)	IN the first 24 hours did the Clinician diagnose Severe Dehydration Signs may include - thirst, dry mucous membranes, low volumes of dark-coloured urine, sunken eyes, reduced skin elasticity.
		Capillary refill time on admission available?	Defined as the time taken for a distal capillary bed to regain its colour after pressure has been applied to cause blanching.
		capillary refill time >2 seconds?	
		Oxygen saturation on:	Choose the Oxygen saturation closest to Pre-Intubation
		Oxygen saturation (pre-intubation)	%
CO-MORBIDITIES AND RISK FACTORS Charlson index will be calculated for each patient at analysis			
	4.1	Chronic cardiac disease, including congenital heart disease (not hypertension)	Please include any of coronary artery disease, heart failure, congenital heart disease, cardiomyopathy, rheumatic heart disease, Congestive Heart Disease, Heart Failure
	4.2	Past use of ACE inhibitor or A2 Blocker	Defined as a previous prescription or requirement for ongoing ACE inhibitor or A2 blocker use, either chronically or sporadically.

	4.3	Obesity (as defined by clinical staff)	This refers to patients for whom an attending clinician has assessed them to be obese - ideally but not necessarily with an objective measurement of obesity, such as calculation of the body mass index (BMI ≥30) or measurement of abdominal girth.
	4.4	Chronic pulmonary disease (not asthma)	Please include any of chronic obstructive pulmonary disease (chronic bronchitis, emphysema), cystic fibrosis, bronchiectasis, interstitial lung disease, pre-existing requirement for long term oxygen therapy. Not Asthma
	4.5	Diabetes with complications	This is defined as diabetes mellitus (type I or type II) requiring oral or subcutaneous treatment with evidence of one or more organ or tissue damage due to diabetes mellitus, irrespective of the need for current treatment of diabetes. Examples of chronic complications include: diabetic cardiomyopathy; diabetic nephropathy; diabetic neuropathy; diabetic retinopathy; diabetic myonecrosis; peripheral vascular disease; coronary artery disease; stroke (other examples exist).
	4.6	Diabetes without complications	This is defined as diabetes mellitus (type I or type II) requiring oral or subcutaneous treatment without evidence of any organ or tissue damage due to diabetes mellitus.
	4.7	Asthma (physician diagnosed)	This is defined as clinician-diagnosed asthma (a common chronic disorder of the airways that is complex and characterized by variable and recurring symptoms, airflow obstruction, bronchial hyper-responsiveness, and underlying inflammation). Current pharmaceutical intervention - for prevention or treatment of symptoms - is not a pre-requisite for the inclusion of this diagnosis.

	4.8	Chronic kidney disease	This is defined as a clinician-diagnosed chronic kidney disease. The KDIGO and KDOQI definition of chronic kidney disease is kidney damage for 3 months, as defined by structural or functional abnormalities of the kidney, with or without decreased glomerular filtration rate (GFR), that can lead to decreased GFR, manifest by either: • Pathologic abnormalities; or • Markers of kidney damage, including abnormalities in the composition of the blood or urine, or abnormalities in imaging tests; • GFR <60 mL/min/1.73 m2 for 3 months, with or without kidney damage. Please include history of kidney transplantation
	4.9	Rheumatologic disorder	This is defined as an inflammatory and degenerative diseases of connective tissue structures. It includes chronic arthropathies and arthritis, connective tissue disorders and vasculitides.
	4.10	Moderate or severe liver disease	This is defined as cirrhosis with portal hypertension, with or without bleeding or a history of variceal bleeding.

	4.11	Dementia	This is defined as: ● Evidence from the history and mental status examination that indicates major impairment in learning and memory as well as at least one of the following: ● Impairment in handling complex tasks ● Impairment in reasoning ability ● Impaired spatial ability and orientation ● Impaired language The cognitive symptoms must significantly interfere with the individual's work performance, usual social activities, or relationships with other people. This must represent a significant decline from a previous level of functioning. The disturbances are of insidious onset and are progressive, based on evidence from the history or serial mental-status examinations. The disturbances are not occurring exclusively during the course of delirium. The disturbances are not better accounted for by a major psychiatric diagnosis. The disturbances are not better accounted for by a systemic disease or another brain disease. Chronic cognitive deficit is included.
	4.12	Mild Liver disease	This is defined as chronic hepatitis or cirrhosis without portal hypertension.
	4.13	Malnutrition	Malnutrition refers to deficiencies, excesses or imbalances in a person's intake of energy and/or nutrients. The term malnutrition covers 2 broad groups of conditions. One is 'undernutrition'—which includes stunting, wasting, underweight and micronutrient deficiencies or. The other is overweight, obesity and diet-related noncommunicable diseases.

	4.14	Chronic neurological disorder	This is defined as conditions in which respiratory function may be compromised due to neurological disease (e.g. polio syndrome sufferers), including individuals with cerebral palsy, multiple sclerosis and related or similar conditions; or hereditary and degenerative disease of the nervous system or muscles; or severe neurological or severe learning disability, or stroke with deficit affecting safety of swallow.
	4.15	Malignant neoplasm	The most common malignant neoplasms are carcinomas (adenocarcinomas or squamous cell carcinomas), Hodgkin and non-Hodgkin lymphomas, leukemias, melanomas, and sarcomas. **It specifically does not include malignancies that have been 'cured' ≥5 years ago with no evidence of ongoing disease relating to that malignancy.** **Do not include non-melanoma skin cancers.** **Do not include benign growths or dysplasia.**
	4.16	Smoker	This refers to a patient who has ever smoked. At least one cigarette / pipe / cigar etc. per day.
	4.17	Chronic hematologic disease	This refers to disorders of red blood cells, white blood cells, platelets, blood vessels, bone marrow, lymph nodes, or the proteins involved in bleeding and clotting. In addition, hematologic diseases include to blood cell cancers, rare genetic disorders, anaemia, conditions related to HIV, sickle cell disease, and complications from chemotherapy or transfusions.
	4.18	AIDS/HIV	This refers to laboratory-confirmed HIV-1 or HIV-2 infection (irrespective of the CD4 lymphocyte count/percentage or HIV viral load in blood), or a patient with an AIDS-defining condition.

	4.19	Chronic Immunosuppression	The patient has received therapy that has suppressed their resistance to infection: e.g. immunosuppression, chemotherapy within 4 weeks of admission, radiation, high-dose steroid treatment (e.g. >1.5mg/kg methyl prednisolone or equivalent for ≥5 days), long term treatment with >20 mg/day steroid.
		Is BMI available? If yes, please state:	Please write down patient's BMI
		Estimated Height	Please estimate height in centimetres
		Estimated Weight	Please estimate weight in kilograms
	4.20	Currently smoking?	Smoking at least one cigarette, cigar, pipe or equivalent per day before the onset of the current illness. Do not include smoke-free tobacco products such as chewed tobacco or electronic nicotine delivery devices.
	4.20.1	What was the most common method of smoking used when the patient was smoking?	What is the most COMMON mode of smoking
	4.20.2	On average how, many packs a day do you smoke?	On Average how many Packs of cigarettes does the patient smoke in a day
	4.20.3	How many years have you smoked?	How many years has the patient smoked
	4.20.4	On average how, many packs a day did you smoke?	Patient given up smoking On Average how many Packs of cigarettes did the patient smoke in a day
	4.20.5	How many years did you smoke?	How many years has the patient smoked
	4.20.6	How many years ago did you quit smoking?	How many years has it been since the patient smoked
	4.20.7	Are pack years known?	Do you know the number of Pack years Is it listed in the patient admission details
	4.20.8	Number of pack years?	What are the pack years if 4.20.7 is YES
	4.21	Other relevant risk factors	Any other risk factors

Redcap Instrument name = Infectious Respiratory Disease Pathogen Testing & Diagnosis			
Section Header	**Number**	**Field Label**	**Instructions and Notes**
INFECTIOUS RESPIRATORY DISEASE PATHOGEN TESTING & DIAGNOSIS			
	5.1	Was pathogen testing done during this illness episode?	Was pathogen testing done during this illness episode: Yes No
	5.2	Influenza:	Choose from: Yes confirmed or yes probable No
	5.2.1	If Yes	Choose from: A/H3N2 A/H1N1pdm09 A/H7N9 A/H5N1 A - not typed B Other
		Other influenza, specify:	Please specify other type of influenza

		Collection date and time	Enter the date the sample was collected: format (DD/MM/YYYY). Enter the time the sample was collected: format of hour/minute (HH/MM) 24 hour format
		Bio specimen type	Select the bio specimen type
		If OTHER; Specify	Please specify other bio specimen type
		Laboratory test method	Choose from: PCR - Polymerase chain reaction Culture Other
		If Other Laboratory test method; Specify	Please specify other laboratory test method
		Pathogen tested / detected	State the name of the pathogen that the test was trying to detect. Where both positive and negative results for a particular sample type exist (from samples taken at different time points during the patient's hospital stay) please record the earliest positive result. If only multiple negative results exist for a particular sample type (from samples taken at different time points

			during the patient's hospital stay), please document the earliest negative result.
		Number of Coronavirus tests performed	Choose from: 1 = 1 2 = 2 3 = 3 4 or more = more than 3
	5.3.1	Coronavirus test 1:	Choose from: Yes confirmed or yes probable No
		If Yes:	Choose from: Novel-CoV MERS-CoV Other CoV
		IF Other coronavirus; Specify:	Please specify other coronavirus
		Collection date and time	Enter the date the sample was collected: format (DD/MM/YYYY). Enter the time the sample was collected: format of hour/minute (HH/MM) 24 hour format

		Bio specimen type	Select the bio specimen type
		If OTHER; Specify	Please specify other bio specimen type
		Laboratory test method	Choose from: PCR - Polymerase chain reaction Culture Other
		If Other Laboratory test method; Specify	Please specify other laboratory test method
		Pathogen tested / detected	State the name of the pathogen that the test was trying to detect. Where both positive and negative results for a particular sample type exist (from samples taken at different time points during the patient's hospital stay) please record the earliest positive result. If only multiple negative results exist for a particular sample type (from samples taken at different time points during the patient's hospital stay), please document the earliest negative result.
	5.3.2	Coronavirus test 2:	Choose from: Yes confirmed or yes probable No

		If Yes:	Choose from: Novel-CoV MERS-CoV Other CoV
		IF Other coronavirus; Specify:	Please specify other coronavirus
		Collection date and time	Enter the date the sample was collected: format (DD/MM/YYYY). Enter the time the sample was collected: format of hour/minute (HH/MM) 24 hour format
		Bio specimen type	Select the bio specimen type
		If OTHER; Specify	Please specify other bio specimen type
		Laboratory test method	Choose from: PCR - Polymerase chain reaction Culture Other
		If Other Laboratory test method; Specify	Please specify other laboratory test method

		Pathogen tested / detected	State the name of the pathogen that the test was trying to detect. Where both positive and negative results for a particular sample type exist (from samples taken at different time points during the patient's hospital stay) please record the earliest positive result. If only multiple negative results exist for a particular sample type (from samples taken at different time points during the patient's hospital stay), please document the earliest negative result.
	5.3.3	Coronavirus test 3:	Choose from: Yes confirmed or yes probable No
		If Yes:	Choose from: Novel-CoV MERS-CoV Other CoV
		IF Other coronavirus; Specify:	Please specify other coronavirus
		Collection date and time	Enter the date the sample was collected: format (DD/MM/YYYY). Enter the time the sample was collected: format of hour/minute (HH/MM) 24-hour format

		Bio specimen type	Select the bio specimen type
		If OTHER; Specify	Please specify other bio specimen type
		Laboratory test method	Choose from: PCR - Polymerase chain reaction Culture Other
		If Other Laboratory test method; Specify	Please specify other laboratory test method
		Pathogen tested / detected	State the name of the pathogen that the test was trying to detect. Where both positive and negative results for a particular sample type exist (from samples taken at different time points during the patient's hospital stay) please record the earliest positive result. If only multiple negative results exist for a particular sample type (from samples taken at different time points during the patient's hospital stay), please document the earliest negative result.
	5.3.4	If more than 3 coronavirus tests, please specify details:	Please specify if more than 3 coronavirus tests

	5.4	RSV	RSV stands for Respiratory syncytial virus. Select from 'yes-confirmed', 'yes-probably', 'no'
		Collection date and time	Enter the date the sample was collected: format (DD/MM/YYYY). Enter the time the sample was collected: format of hour/minute (HH/MM) 24 hour format
		Bio specimen type	Select the bio specimen type
		If OTHER; Specify	Please specify other bio specimen type
		Laboratory test method	Choose from: PCR - Polymerase chain reaction Culture Other
		If Other Laboratory test method; Specify	Please specify other laboratory test method

		Pathogen tested / detected	State the name of the pathogen that the test was trying to detect. Where both positive and negative results for a particular sample type exist (from samples taken at different time points during the patient's hospital stay) please record the earliest positive result. If only multiple negative results exist for a particular sample type (from samples taken at different time points during the patient's hospital stay), please document the earliest negative result.
	5.5	Adenovirus	Choose from: Yes confirmed or yes probable No
		Collection date and time	Enter the date the sample was collected: format (DD/MM/YYYY). Enter the time the sample was collected: format of hour/minute (HH/MM) 24 hour format
		Bio specimen type	Select the bio specimen type
		If OTHER; Specify	Please specify other bio specimen type

		Laboratory test method	Choose from: PCR - Polymerase chain reaction Culture Other
		If Other Laboratory test method; Specify	Please specify other laboratory test method
		Pathogen tested / detected	State the name of the pathogen that the test was trying to detect. Where both positive and negative results for a particular sample type exist (from samples taken at different time points during the patient's hospital stay) please record the earliest positive result. If only multiple negative results exist for a particular sample type (from samples taken at different time points during the patient's hospital stay), please document the earliest negative result.
	5.6	Bacteria	Streptococcus pneumoniae, Haemophilus influenzae, Chlamydia pneumoniae, Mycoplasma pneumoniae, and Legionella pneumophila. Select from 'yes - confirmed case' or 'no'
		Collection date and time	Enter the date the sample was collected: format (DD/MM/YYYY). Enter the time the sample was collected: format of hour/minute (HH/MM) 24 hour format

		Bio specimen type	Select the bio specimen type
		If OTHER; Specify	Please specify other bio specimen type
		Laboratory test method	Choose from: PCR - Polymerase chain reaction Culture Other
		If Other Laboratory test method; Specify	Please specify other laboratory test method
		Pathogen tested / detected	State the name of the pathogen that the test was trying to detect. Where both positive and negative results for a particular sample type exist (from samples taken at different time points during the patient's hospital stay) please record the earliest positive result. If only multiple negative results exist for a particular sample type (from samples taken at different time points during the patient's hospital stay), please document the earliest negative result.
	5.7	Other infectious respiratory diagnosis:	Choose from: Yes confirmed or yes probable No

		If YES: Other infectious respiratory diagnosis, specify:	If the pathogen is 'Other', please fill in the name of the suspected pathogen
		Collection date and time	Enter the date the sample was collected: format (DD/MM/YYYY). Enter the time the sample was collected: format of hour/minute (HH/MM) 24 hour format
		Bio specimen type	Select the bio specimen type
		If OTHER; Specify	Please specify other bio specimen type
		Laboratory test method	Choose from: PCR - Polymerase chain reaction Culture Other
		If Other Laboratory test method; Specify	Please specify other laboratory test method
		Pathogen tested / detected	State the name of the pathogen that the test was trying to detect. Where both positive and negative results for a particular sample type exist (from samples taken at different time points during the patient's hospital stay) please record the earliest positive result. If only multiple negative results exist for a particular sample type (from samples taken at different time points

			during the patient's hospital stay), please document the earliest negative result.
	5.8	Pneumonia:	Clinical Pneumonia is an acute inflammatory process of the lungs due to suspected or proven infection with clinical and, if available, radiological evidence of focal or diffuse lung infiltrates that the treating clinician believes to be due to pneumonia. Choose from Yes, No, Unknown.
		Collection date and time	Enter the date the sample was collected: format (DD/MM/YYYY). Enter the time the sample was collected: format of hour/minute (HH/MM) 24 hour format
		Bio specimen type	Select the bio specimen type
		If OTHER; Specify	Please specify other bio specimen type

		Laboratory test method	Choose from: PCR - Polymerase chain reaction Culture Other
		If Other Laboratory test method; Specify	Please specify other laboratory test method
		Pathogen tested / detected	State the name of the pathogen that the test was trying to detect. Where both positive and negative results for a particular sample type exist (from samples taken at different time points during the patient's hospital stay) please record the earliest positive result. If only multiple negative results exist for a particular sample type (from samples taken at different time points during the patient's hospital stay), please document the earliest negative result.
	5.9	IF NONE OF THE ABOVE: Suspected Non-infective:	If the final diagnosis is unknown or non-infective, place a cross in Unknown/Non infective (e.g. pulmonary embolism)

Redcap Instrument name = Outcome Form			
Section Header	**Number**	**Field Label**	**Instructions and Notes**
COMPLICATIONS: At any time during hospitalisation did the patient experience: **Refers to any complication that occurred at any time during the patient's hospital stay with confirmed or suspected COVID-19 infection**			
	6.1	Viral Pneumonitis	Is defined as pneumonia (pneumonitis) that is believed to occur as a direct consequence of an infecting virus/infecting viruses. Viral pneumonitis may be a clinical diagnosis, with or without radiographic or histopathological evidence of lung consolidation. Although preferred, identification of the infecting viral species is not essential to make the diagnosis.
	6.2	Bacterial pneumonia	Is defined as pneumonia (pneumonitis) that is believed to occur as a direct consequence of infecting bacteria. It is an acute infection of the lung parenchyma caused by bacteria (e.g., Streptococcus pneumoniae, Haemophilus influenzae, Chlamydia pneumoniae, Mycoplasma pneumoniae, and Legionella pneumophila). Signs and symptoms include productive cough, fever, chills, shortness of breath, and chest pain. Bacterial pneumonia may be a clinical diagnosis, with or without radiographic or histopathological evidence of lung consolidation. Although preferred, identification of the infecting bacterial species is not essential to make the diagnosis.

	6.3	Bacteraemia	Is defined as the presence of bacteria in blood, most often detected through blood culture investigation. Episodes of suspected artefactual contamination of a blood culture should not be recorded.
	6.4	Stroke / CVA	Stroke may be a clinical diagnosis, with or without supportive radiological findings.
	6.5	Cardiac arrhythmia (requiring specific chemical/electrical therapy)	Refers to **any variation from the normal rate or rhythm** in the heart, confirmed by electrocardiographic monitoring.
	6.6	Pneumothorax or pneumomediastinum or subcutaneous emphysema on CXR/CT chest	Pneumothorax is defined as the abnormal presence of air in the pleural cavity (between the lungs and the chest wall), causing collapse of the lung. It may be diagnosed clinically, usually with radiological confirmation.
	6.7	Cardiac arrest	Sudden cessation of cardiac activity.
	6.8	Pulmonary embolism	Pulmonary Embolism as confirmed by CTPA, V/Q or other imaging.
	6.9	Deep Vein Thrombosis	Deep Vein Thrombosis as confirmed by ultrasound.
	6.10	Acute cardiac injury/dysfunction	Select 'Yes' if falls under one or more of the following categories: - New LV dysfunction (≥mild LV dysfunction on echo report or EF<50% or CI <1.8 or <2.2 on inotropes*) - New RV dysfunction (≥mild dysfunction on echo report or TAPSE <1.6cms) - Troponin rise considered to be cardiac in origin (high sensitivity troponin reference range is ≤26ng/L; Standard troponin level is <0.04ug/L) *Via echo, flow track, swan, or other

		If other complications, please state	If 'Other', please specify complications.
PATIENT OUTCOME INFORMATION			
	7.1	Date and time of ICU discharge	What was the date of Discharge From ICU If the patient had a readmission to ICU mention it in Outcomes Section 9 and fill in Section 10. Number of days not accommodated in this section but accommodated in Outcomes Section 10.
	7.2	Chest CT scan done that assisted in diagnosis during ICU admission	Was a CT scan used to assist with Diagnosis.
	7.2.1	Date and time of chest CT	What was the Date and time of the CT chest earliest
	7.3	ICU discharge location	How / where was the patient discharged to……. If patient died in ICU make that the date and time of discharge from ICU as well as the date and time of discharge from Hospital. If patient was discharged straight to home, please state in comment log button next to data field.
Medication: While in Hospital were any of the following administered			
	7.4	Antiviral agent?	'Antiviral Agent' refers to any agent(s) prescribed to treat or prevent viral infections by interfering with the viral replication cycle. Examples of neuraminidase inhibitors include oseltamivir, ribavirin, acyclovir and lopinavir/ritonavir (note that other examples exist). Topical preparations are not included. If an antiviral was administered at any point during the patient's hospital stay with suspected or confirmed COVID-19, or was prescribed at the time of discharge, place a cross (X) in the box marked 'yes'. If yes, please specify the type.

	7.5	Antibiotic?	'Antibiotic' refers to any agent(s)that selectively target microorganisms not humans. If an antibiotic was administered at any point during the patient's hospital stay, or was prescribed at the time of discharge, place a cross (X) in the box marked 'yes'. If not, place a cross in the box marked 'no'.
	7.6	Corticosteroid?	'Corticosteroids' (commonly referred to as 'steroids'). Examples include: prednisolone, prednisone, methyl-prednisolone, dexamethasone, hydrocortisone, fluticasone, betamethasone (note that other examples exist). Topical preparations are not included, but inhaled preparations are included. The indication for administering corticosteroids is not important and does not need to be directly related to the treatment of illness from COVID-19 infection. If a corticosteroid was administered at any point during the patient's hospital stay or was prescribed at the time of discharge from the hospital, place a cross (X) in the box marked 'yes'.
	7.4.1	IF YES to antiviral agent	Specify type of antiviral agent. If 'Other', choose 'Other' option.
	7.4.2	If 'Other' antiviral agent, specify type	If 'Other', please specify antiviral type.
	7.4.3	Was the antiviral agent given in ICU?	Select 'Yes' if the antiviral agent was given in ICU.
		Was the antiviral agent given to treat COVID-19?	Select 'Yes' if the antiviral agent was given to treat COVID-19.
		Did the patient receive hydroxychloroquine?	Select 'Yes' if the patient received hydroxychloroquine.
	7.6.1	If YES to Corticosteroid, specify route	Please select from 'oral', 'intravenous' or 'inhaled'.
	7.7	Was patient part of a COVID study?	Please select from 'Yes' if patient was part of a COVID study.
	7.7.1	Study name	Specify study name.
	7.7.2	Was a drug given as part of the trial	Please select 'Yes' if a drug was given as part of the trial.

	7.7.3	Drug name	Please specify drug name.
	7.7.4	Dose given	As per Study protocol.
	7.7.5	Duration of drug administration (days)	Please specify how many days was the drug administered.
	7.7.6	In the treating clinician's opinion, did the drug improve patient condition?	Select 'Yes' if there was improvement.
Patient System Improvement			
		Circulatory	In the judgment of the clinician managing the patient or written in the Discharge ICU or hospital notes was there an improvement in this system attributed to the study drug listed above. This is an objective measure by the treating clinician. If unavailable or unable to find data - mark as Not Available
		Digestive	In the judgment of the clinician managing the patient or written in the Discharge ICU or hospital notes was there an improvement in this system attributed to the study drug listed above. This is an objective measure by the treating clinician. If unavailable or unable to find data - mark as Not Available.
		Endocrine	In the judgment of the clinician managing the patient or written in the Discharge ICU or hospital notes was there an improvement in this system attributed to the study drug listed above. This is an objective measure by the treating clinician. If unavailable or unable to find data - mark as Not Available.

		Integumentary	In the judgment of the clinician managing the patient or written in the Discharge ICU or hospital notes was there an improvement in this system attributed to the study drug listed above. This is an objective measure by the threating clinician If unavailable or unable to find data - mark as Not Available
		Immune	In the judgment of the clinician managing the patient or written in the Discharge ICU or hospital notes was there an improvement in this system attributed to the study drug listed above. This is an objective measure by the threating clinician If unavailable or unable to find data - mark as Not Available
		Muscular	In the judgment of the clinician managing the patient or written in the Discharge ICU or hospital notes was there an improvement in this system attributed to the study drug listed above. This is an objective measure by the threating clinician If unavailable or unable to find data - mark as Not Available
		Nervous	In the judgment of the clinician managing the patient or written in the Discharge ICU or hospital notes was there an improvement in this system attributed to the study drug listed above. This is an objective measure by the threating clinician If unavailable or unable to find data - mark as Not Available

		Renal	In the judgment of the clinician managing the patient or written in the Discharge ICU or hospital notes was there an improvement in this system attributed to the study drug listed above. This is an objective measure by the threating clinician If unavailable or unable to find data - mark as Not Available
		Reproductive	In the judgment of the clinician managing the patient or written in the Discharge ICU or hospital notes was there an improvement in this system attributed to the study drug listed above. This is an objective measure by the threating clinician If unavailable or unable to find data - mark as Not Available
		Respiratory	In the judgment of the clinician managing the patient or written in the Discharge ICU or hospital notes was there an improvement in this system attributed to the study drug listed above. This is an objective measure by the threating clinician If unavailable or unable to find data - mark as Not Available
		Skeletal	In the judgment of the clinician managing the patient or written in the Discharge ICU or hospital notes was there an improvement in this system attributed to the study drug listed above. This is an objective measure by the threating clinician If unavailable or unable to find data - mark as Not Available

	7.8	Hospital Outcome:	On hospital discharge for this patient enter the most appropriate classification for the patient **Discharged alive:** If, at the time the outcome section is completed, the patient is known to have been alive when discharged from the clinical or medical facility, place a cross (X) in the box. **Transfer to other facility (acute hospital):** If the patient was transferred (moved) from the current centre or medical facility to another medical facility which is a acute hospital please place a cross (X) in this box. **Transfer to other facility (rehab):** If the patient was transferred (moved) from the current centre or medical facility to another medical facility which is a rehabilitation facility please place a cross (X) in this box. **Palliative discharge:** No definition currently available **Death:** If patient has passed away. **Other:** If the answer is anything else other than above.
	7.9	Cause of death	Select cause of death. Choose 'Other' if cause of death is not in the list and specify.
		If other cause of death, please specify	
	7.10	Ability to self-care at discharge versus before illness	Is the patient is able to care for themselves at discharge (in terms of activities of daily living) at the same level as before they developed illness then place a cross in the box marked ‘same as before illnesses. If their ability to self-care has decreased or increased, then place a cross in the appropriate box (‘worse’ or ‘better’). If the answer is not known, place a cross in the box marked ‘N/A or unknown’.
	7.11	Date and time of hospital discharge	Enter the date and time the patient was discharged.
	7.12	Date and time of death	Enter the date and time the patient passes away.
Post Discharge Support			
	8.1	Discharged with new supportive care	Select 'Yes' if patient was discharged with supportive care

	8.1.1	Please specify support	Was the patient discharged with any extra support **that was not required prior to Admission**. This may include physical or personal supports. Wheelchair Home help / daily visit
	8.1.2	Please specify other form of support	Please specify if you selected 'other' in 8.1.1.
Additional Information			
	9	Detail any additional information NOT captured in the CASE REPORT FORM	
10. Readmission to ICU			
	10.1	Did the patient get readmitted to ICU?	Select 'Yes' if patient was readmitted to ICU.
	10.1.1	What was the diagnosis?	If YES to 10.1, please state diagnosis for readmission.
	10.1.2	How many days were they in ICU during readmission?	State number of days patient was admitted for during ICU readmission.
	10.1.3	Were they discharged from ICU alive?	Select ‘Yes’ if patient was discharged from ICU alive.

Redcap Instrument name = Daily Form			
Section Header	**Number**	**Field Label**	**Instructions and Notes**
DAILY ASSESSMENT FORM (on admission to ICU, then complete daily) - If a patient already in ICU develops COVID-19, then day 1 of "Daily form" is started as soon as they are suspected to be COVID-19			
		DATE OF ASSESSMENT	Indicate at the beginning of the Daily Case Record Form the day of data collection and sampling (may not be the date of completion). This will be in the format of day/month/year (DD/MM/YYYY).
		Is patient still managed as COVID-19	Choose from the options on whether patient is no longer COVID-19 or remains as COVID-19. If no longer COVID cease data collection.
		Is this day a re-admission day to ICU?	Identify if the patient was re-admitted to the ICU. If this is the case, select yes and enter daily data for readmission.
	1.1a	Is the patient being managed	Choose from the relevant option on the ratio of nurse management to patient being managed.
	1.1b	Patient hospital location	Identify patient's hospital location where ICU is intensive care unit, HDU is high dependency unit, and any other set up as ICU or HDU.

	1.1c	Did the patient contract COVID while in ICU for an unrelated reason	Identify if the patient was admitted to the ICU for another reason and the clinician believes that they contracted COVID-19 whilst in ICU. If this is the case, select yes.
		Does your current workload allow for data entry into desirable fields? Please note that this will close 3 separate sections within this form.	Indicate whether data entry staff's workload enables for additional data entry to be completed for "desirable" data fields. Select "No" from day 3 onwards in all cases, and from 3rd day of readmission
Record the worst value from 00:00-24:00 taken on day of assessment (if Not Available please leave data field blank and write 'N/A' in comment log button next to data field): PLEASE NOTE: FiO2, SaO2/SpO2, PaO2 and PaCO2 should all come from the same ABG with the worst P:F ratio for the day.			
	1.2	FiO2	Record FiO2 value within the range of 0.2-1.0. If the patient has not received supplemental oxygen therapy in the previous 24 hours, enter 0.21. If the patient received supplemental oxygen through a mask that delivers a known concentration of oxygen (e.g. a venturi mask) or is being ventilated, please provide the fraction of inspired oxygen (FiO2) delivered. FiO2, SaO2/SpO2, PaO2 and PaCO2 should all come from the same ABG with the worst P:F ratio for the day.
	1.3	SaO2 / SpO2	Record SaO2 / SpO2 in %. SaO2 (oxygen saturation) as determined by arterial blood gas analysis or transcutaneous pulse oximetry. FiO2, SaO2/SpO2, PaO2 and PaCO2 should all come from the same ABG with the worst P:F ratio for the day.
	1.4	PaO2	Record PaO2 either in KP or mmHg. PaO2 (partial pressure of oxygen in blood) as determined by arterial/venous/capillary blood gas analysis. FiO2, SaO2/SpO2, PaO2 and PaCO2 should all come from the same ABG with the worst P:F ratio for the day.
		PaO2 unit:	Select the unit of measurement based on the ouput of your blood gas analyser.

		PaO2 sample type	Select the appropriate PaO2 sample type used for blood gas analysis.
	1.5	PaCO2	PaCO2 is the partial pressure of carbon dioxide measured in the sample. This measurement should come from the same ABG with the worst P:F ratio for the day.
		PaCO2 Unit	Select the unit of measurement based on the ouput of your blood gas analyser.
	1.6	pH Document from same ABG with the worst P:F ratio	pH is the measure of the activity of the (solvated) hydrogen ion (H+) measured in the sample. Record this value from the same blood gas record as PaO_2.
	1.7	HCO3- Document from same ABG with the worst P:F ratio	mmol/L. HCO3- refers to the bicarbonate measured in the blood gas sample. Record this value in mmol/L from the same blood gas record as PaO_2.
	1.8	Base excess Document from same ABG with the worst P:F ratio	Base excess refers to standardised base excess (SBE). If standardised base excess is not reported, enter the base excess value presented, this can be either a positive or negative value. Record this value in mmol/L from the same blood gas record as PaO_2.
	1.9	Glasgow Coma Score: Lowest for the day	Insert the lowest calculated value (between 3-15) on the date of assessment following the assessment of eye, motor and verbal responses. Please add the score for eye, verbal and motor responses and enter the total score in the between the range of 3 to 15. If the patient is intubated and/or sedated please document the patients GCS recorded closest to but prior to intubation and / or sedation.
	1.10	Systolic Pressure Worst value	Record the worst verified value in the previous 24 hours in mmHg.

	1.11	Diastolic Pressure Worst value	Record the worst verified value in the previous 24 hours in mmHg.
	1.12	Mean Arterial Pressure Worst value relating to APACHE II	Record the mean arterial pressure (in mmHg) as determined by invasive (arterial) blood pressure measurement, if a non-invasive/manual method was used e.g. sphygmomanometer calculate the MAP using the following formula MAP = [(2 x diastolic)+systolic] / 3 if blood pressure measured non-invasively. Please fill in the lowest value recorded during the 24hours period.
	1.13	Urine output for 24 hours From 00:00 to 23:59	Record the total patient's urine output (in ml) for the 24 hours or day of assessment.
	1.14	High-flow nasal canula oxygen therapy?	Record yes if the patient was treated with HFNC or High flow Nasal Prong oxygen therapy for at least one continuous hour during the study day. If HFNC was provided only for humidification (e.g. FIO2 was equal to or less than 0.21), select no.
	1.15	Non-invasive ventilation (e.g. BIPAP, CPAP)?	If the patient received non-invasive ventilation (NIV), defined as the provision of ventilatory support through the patient's upper airway using a mask or similar device, at any time on the date of assessment, record 'yes'. Please note that BiPAP and CPAP ventilation modes are not unique to NIV; they can also be given via invasive mechanical ventilation, so please check.
	1.16	Invasive ventilation?	Invasive ventilation means that patient has undergone tracheal intubation, for the purpose of invasive mechanical ventilation. Invasive ventilation is a method to mechanically assist or replace spontaneous breathing in patients by use of a powered device that forces oxygenated air into the lungs. The mode of intubation may be orotracheal, nasotracheal, or via a cricothyrotomy or tracheotomy. If invasive ventilation was used at any time on the date of assessment, record 'yes'.

	1.17	Any vasopressor / inotropic support?	A vasopressor is a pharmaceutical agent that causes vasoconstriction, thereby increasing blood pressure. Agents include norepinephrine, epinephrine, vasopressin, terlipressin and phenylephrine. Some inotropes also demonstrate vasopressor activity. An inotrope is a pharmaceutical agent that alters the force of myocardial contractility. Commonly used 'positive' inotropes include dobutamine, dopamine, milrinone and adrenaline (epinephrine). If the patient received a vasopressor or inotrope at any time on the date of assessment, record 'yes'.
	1.18a	Dobutamine OR Milrinone OR Levosimendan (any dose) OR Dopamine < 5 mcg/min	If selected 'yes' to 1.17 - record whether patient has received this.
	1.18b	Epinephrine/Norepinephrine < 0.1 mcg/kg/min OR Vasopressin (any dose) OR Phenylephrine OR Dopamine 5-15 mcg/min	If selected 'yes' to 1.17 - record whether patient has received this.
	1.18c	Epinephrine/Norepinephrine > 0.1 mcg/kg/min OR Dopamine > 15 mcg/min	If selected 'yes' to 1.17 - record whether patient has received this.
	1.19	Dialysis / Hemofiltration?	Dialysis or renal replacement therapy includes haemodialysis, peritoneal dialysis (PD), intermittent haemodialysis (IHD), on-line intermittent haemofiltration (IHF), on-line haemodiafiltration (IHDF), continuous haemofiltration (CHF) and continuous haemodiafiltration (CHDF), continuous venovenous haemofiltration (CVVH), continuous venovenous haemodialysis(CVVHD), continuous venovenous haemodiafiltration (CVVHDF), slow continuous ultrafiltration (SCUF), continuous arteriovenous haemofiltration (CAVHD) and sustained low-efficiency dialysis (SLED).If the patient received dialysis or RRT at any time on the date of assessment, record 'yes'.

	1.2	Neuromuscular blocking agents?	Neuromuscular blocking agents may facilitate lung protective mechanical ventilation by improving patient–ventilator synchrony and allowing for the accurate adjustment of tidal volume and pressure levels. If the patient received neuromuscular blocking agents including cisatracurium, vecuronium, atracurium , pancuronium, rocuronium at any time on the date of assessment, record 'yes'.
	1.21	Prone Positioning	Prone ventilation refers to mechanical ventilation with the patient lying in the prone position. If the patient received prone ventilation at any time during their hospital stay, record 'yes'.
	1.22	Inhaled Nitric Oxide ?	If the patient received inhaled nitric oxide at any time during their hospital stay, record 'yes'.
	1.23	ECMO?	ECMO is the provision of oxygen and carbon dioxide exchange through the use of an extracorporeal circuit consisting minimally of a blood pump, artificial lung, and vascular access cannula, using blood flows sufficient to support oxygenation and concomitantly enhance carbon dioxide removal.
	1.24	Tracheostomy inserted?	Tracheostomy is required in patients requiring prolonged mechanical ventilation and ICU. If the patient underwent the surgical securing of the airway using either open surgical (OS) or percutaneous dilatational tracheostomy (PDT), record 'yes'.
	1.25	Other cardiac intervention or procedure?	Please mention here any other specific cardiac therapeutic intervention(s) or procedure(s) not otherwise characterised that you believe may be relevant.

		If YES to ECMO, please specify	If answered 'yes' to 1.23, specify. Veno-venous (VV) support is the application of extracorporeal circulation primarily for respiratory support, in which the extracorporeal circuit drains blood from the venous system and reinfuses into the venous system. VV ECMO operates in series with the heart and lungs, and does not provide bypass of these organs. Veno-arterial is the application of extracorporeal circulation often for cardiac or circulatory support, in which the extracorporeal circuit drains blood from the venous system and returns into the systemic arterial system. Without qualification, VA ECMO refers to support that returns blood to the systemic arterial system, operating in parallel with and providing partial, or complete, bypass of the heart and lungs.
		If YES other intervention, Specify,	If answered 'yes' to 1.25, specify.
DAILY LABORATORY RESULTS (on admission to ICU, then complete daily). Record the worst value from 00:00-24:00 taken on day of assessment (if Not Available please leave data field blank and write 'N/A' in comment log button next to data field). PLEASE NOTE: This section will close if workload does not allow for entering of desirable fields.			
	2.1	Results available for sample taken on the date in section 1 above?	Select from 'Yes' if there are laboratory results available for the study day in question.
	2.2	Platelet Count	Platelet Count refers to the platelet count in blood.
		Platelets Unit	Record the platelets measurement unit.
	2.3	Total Bilirubin	Total Bilirubin refers to total bilirubin measured in the blood, record in µmol/L.
	2.4	Lactate	Lactate refers to blood lactate.
		Lactate Unit	Record the lactate measurement unit.
	2.5	Creatinine	Creatinine refers to serum creatinine.
		Creatinine Unit	Record the creatinine measurement unit.

Please note that the DAILY form is a repeatable form that needs to be filled in over 14 days. Kindly use the Record Status Dashboard (button on left hand) to navigate and complete the remaining form labelled OUTCOME Note on Daily form being a repeatable form over 14 days of ICU stay.			
DESIRABLE DAILY LABORATORY RESULTS (on admission, on any admission to ICU, then daily). Record the worst value from 00:00-24:00 taken on day of assessment (if Not Available please leave data field blank and write 'N/A' in comment log button next to data field). PLEASE NOTE: This section will close if workload does not allow for entering of desirable fields.			
	3.1	Chest X-ray performed?	This section refers only to any chest x-rays that were routinely performed at the time that the patient stayed in the hospital and collected on the date of assessment. If no chest x-ray was performed select 'no'.
		If yes, were infiltrates present?	If 'Yes' to 3.1, select whether infiltrates were present.
		If yes, then number of quadrants involved.	If 'Yes' to infiltrates, select all number of quadrants involved.
	3.2	Haemoglobin	Haemoglobin (Hb or Hgb) refers to haemoglobin concentration measurement in blood.
		Haemoglobin Unit	Select the haemoglobin measurement unit.
	3.3	WBC count Lowest for the day	WBC count is the total white blood cell count in blood. Record the lowest value of the day. If only one measurement was taken for the day, please leave a note in the comment log next to data field.
		WBC Unit	Select the WBC measurement unit.

	3.3.1	WBC count Highest for the day	WBC count is the total white blood cell count in blood. Record the highest value of the day. If only one measurement was taken for the day, please leave a note in the comment log next to data field.
		WBC Unit	Select the WBC measurement unit.
	3.4	Lymphocyte count Lowest value for the day	Lymphocyte count is the total lymphoctye count in blood. Record the lowest value as 10^9/L.
	3.5	Neutrophil count Lowest value for the day	Neutrophil count is the total neutrophil count in blood. Record the lowest value as 10^9/L.
	3.6	Haematocrit	Haematocrit (Ht or HCT), also known as packed cell volume (PCV) or erythrocyte volume fraction (EVF), is the volume percentage (%) of red blood cells in blood. Record this value as L/L.
	3.7	APTT/APTR	APTT is the activated partial thromboplastin time, measured in seconds. APTR is the activated partial thromboplastin ratio. Enter the relevant value.
	3.8	PT	PT is the prothrombin time. Record the value in seconds.
	3.9	INR	INR is the international normalised ratio.
	3.1	ALT / SGPT	ALT is alanine transaminase (also called serum glutamic pyruvate transaminase, SGPT). Record the value in U/L.
	3.11	AST/SGOT	AST/SGOT is aspartate transaminase (also called serum glutamic oxaloacetic transaminase, SGOT). Record the value in U/L.
	3.12	Glucose Highest for the day	Glucose refers to blood glucose. Record the highest value for the day.
		Glucose Unit	Select the glucose measurement unit.
	3.13	Blood Urea Nitrogen (urea)	Blood urea nitrogen is also known as ‘urea’, measured in a blood sample.

		Blood Urea Nitrogen (urea) – choose from the following	Select whether the value is an exact value, less than, or more than value.
		Blood Urea Nitrogen (urea) units	Select the blood urea nitrogen measurement unit.
	3.14	Sodium	Sodium refers to blood sodium, record the value in mmol/L.
	3.15	Potassium	Potassium refers to blood potassium, record the value in mmol/L.
	3.16	C-reactive protein (CRP)	CRP is C-reactive protein and refers to the blood (serum or plasma) CRP level. Record the measurement in mg/L.
	3.17	Daily Fluid Balance (ml) Total for the day	Please enter the daily cumulative fluid balance as recorded closest to midnight on the study day of interest in mls.
	3.18	Troponin (ng)	Record the highest total troponin measurement in ng/L.
		Troponin (ng) value - choose from the following	Select whether the value is an exact value, less than, or more than value.
	3.19	Troponin i (ng)	Record the highest cardiac troponin measurement in ng/L.

Please note that the DAILY form is a repeatable form that needs to be filled in over 14 days. Kindly use the Record Status Dashboard (button on left hand) to navigate and complete the remaining form labelled OUTCOME.