

## ICNARC report on COVID-19 in critical care

03 April 2020

This report contains data on all confirmed COVID-19 cases reported to ICNARC up to midday on 02 April 2020 from critical care units participating in the Case Mix Programme (all NHS adult, general intensive care and combined intensive care/high dependency units in England, Wales and Northern Ireland, plus some specialist and non-NHS critical care units).

### Reporting process

Critical care units participating in the Case Mix Programme are asked to:

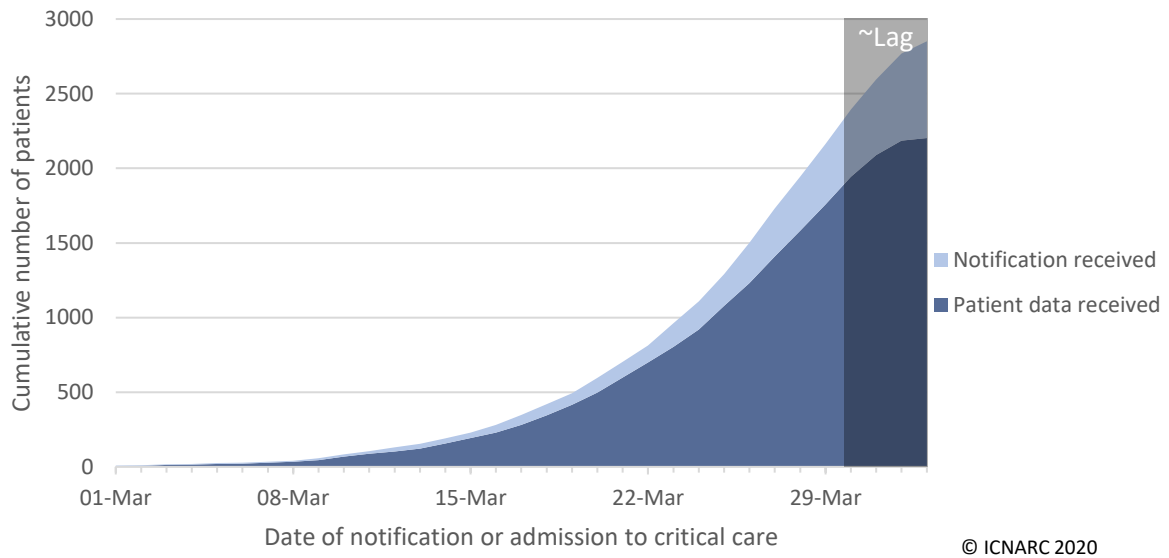
- notify ICNARC as soon as they have an admission with confirmed COVID-19;
- submit early data for admissions with confirmed COVID-19, including demographics and first 24-hour physiology, as soon as possible after the end of the first 24 hours in the critical care unit;
- resubmit data, including critical care unit outcome and organ support, when the patient leaves the critical care unit; and
- submit final data when the patient leaves acute hospital.

### Critical care unit participation

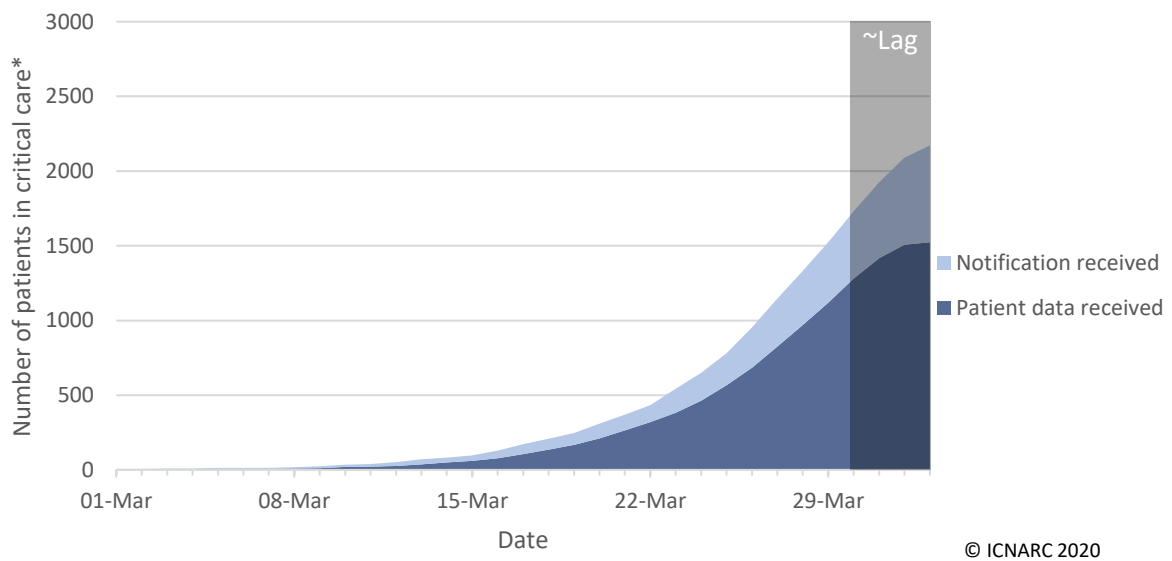
Total number of units:	286
Units with at least one patient notified:	210
Units with zero patients:	53
Units with uncertain participation:	23

### Admissions to critical care

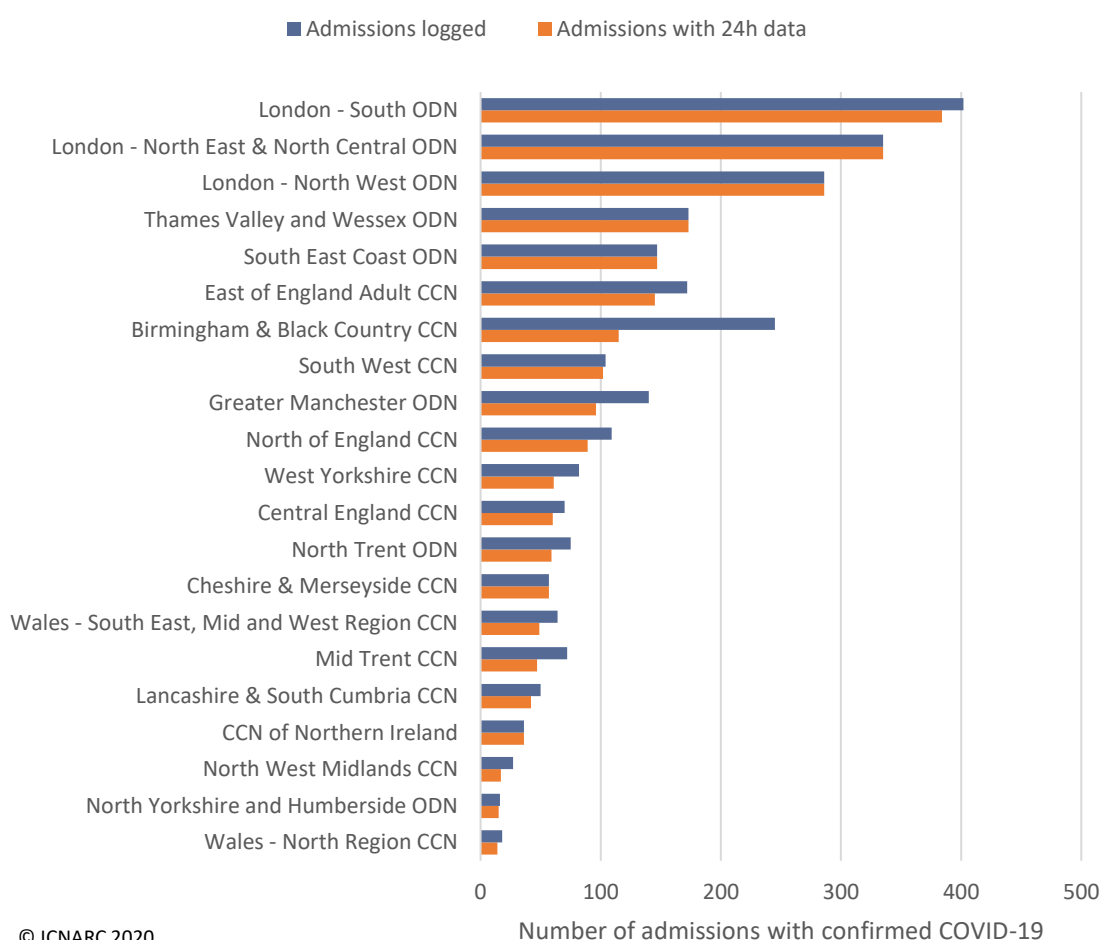
To date, ICNARC have been notified of 2621 admissions to critical care units in England, Wales and Northern Ireland with confirmed COVID-19 either at or after admission to critical care. Of these, early data covering the first 24 hours in the critical care unit have been submitted to ICNARC for 2333 admissions of 2204 patients (Figure 1). Of the 2204 patients, 340 patients have died, 340 patients were discharged alive from critical care and 1524 patients were last reported as still being in critical care (Figure 2). The largest number of patients (924) are being managed by the three London Operational Delivery Networks (Figure 3). Note that Figure 1 and Figure 2 are affected by a variable lag time in submission of data of about 1-3 days (shaded grey).



**Figure 1 Cumulative number of patients critically ill with confirmed COVID-19 and 24h patient data received, by date of notification or admission to critical care**



**Figure 2 Number of patients critically ill with confirmed COVID-19, by date**  
 \*Note: Patients for whom no outcomes have been received are assumed to remain in critical care as of 02 April 2020.



**Figure 3 Admissions by Critical Care Network**

ODN: Organisational Delivery Network; CCN: Critical Care Network.

## Characteristics of admitted patients

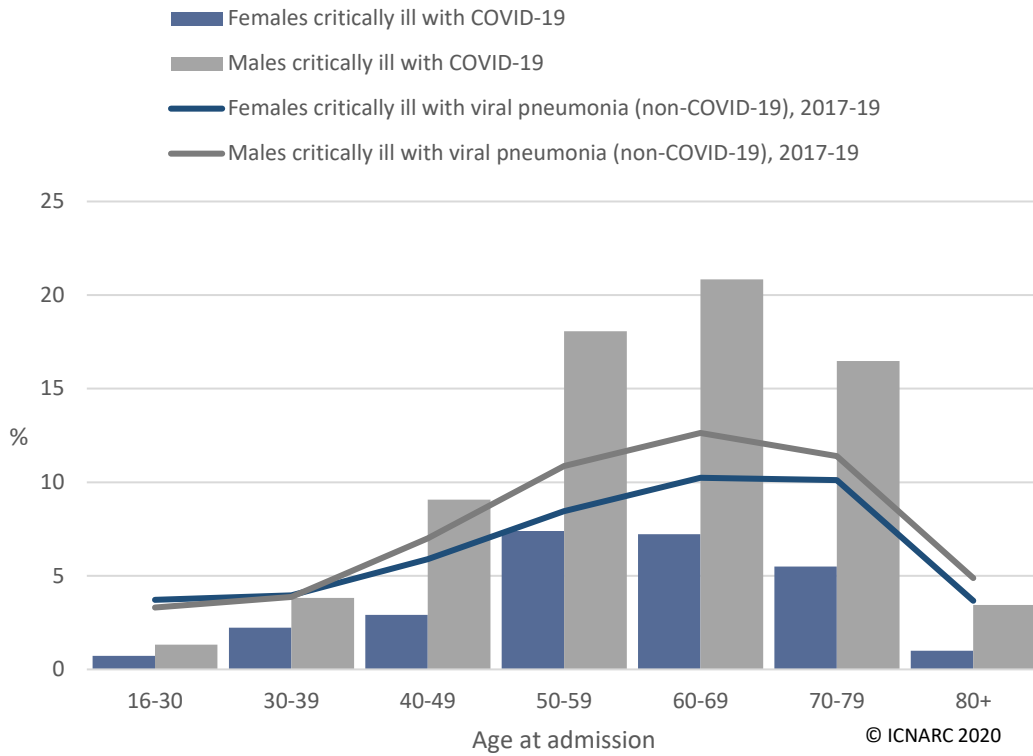
Characteristics of patients with confirmed COVID-19 admitted to critical care are summarised in Table 1, and compared with patients critically ill with viral pneumonia (non-COVID-19) during 2017-19. The distribution of age and sex is shown in Figure 4, the distribution of ethnicity is shown in Figure 5 and the distribution of body mass index (BMI) is shown in Figure 6.

Characteristics for patients receiving advanced respiratory support and those receiving basic respiratory support only are summarised in Table 2.

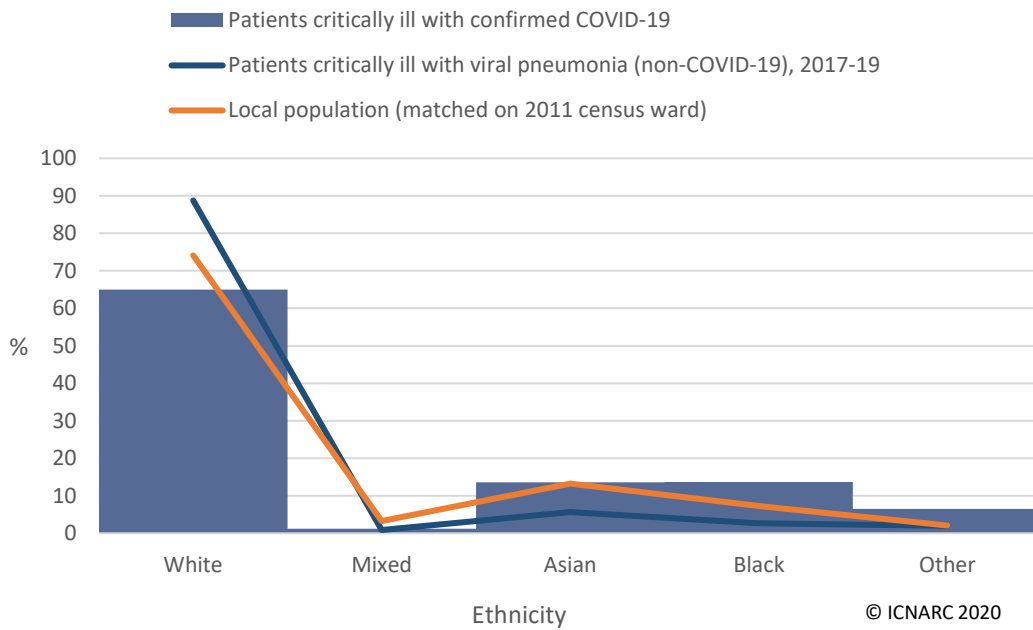
**Table 1 Characteristics of patients critically ill with confirmed COVID-19**

Demographics	Patients with confirmed COVID-19 and 24h data (N=2204)	Patients with viral pneumonia (non-COVID-19), 2017-19 (N=4759)
Age at admission (years) [N=2204]		
Mean (SD)	60.0 (13.2)	58.1 (17.4)
Median (IQR)	61 (52, 70)	61 (48, 71)
Sex, n (%) [N=2203]		
Female	594 (27.0)	2191 (46.0)
Male	1609 (73.0)	2568 (54.0)
Currently or recently pregnant, n (% of females) [N=565]		
Currently pregnant	2 (0.4)	40 (1.8)
Recently pregnant (within 6 weeks)	9 (1.6)	23 (1.0)
Not known to be pregnant	554 (98.1)	2128 (97.1)
Ethnicity, n (%) [N=1916]		
White	1245 (65.0)	4098 (88.8)
Mixed	23 (1.2)	41 (0.9)
Asian	260 (13.6)	262 (5.7)
Black	263 (13.7)	125 (2.7)
Other	125 (6.5)	91 (2.0)
Body mass index, n (%) [N=1886]		
<18.5	14 (0.7)	237 (5.1)
18.5-<25	485 (25.7)	1603 (34.4)
25-<30	677 (35.9)	1401 (30.0)
30-<40	581 (30.8)	1093 (23.4)
40+	129 (6.8)	332 (7.1)
<b>Medical history</b>		
Dependency prior to admission to acute hospital, n (%) [N=2000]		
Able to live without assistance in daily activities	1856 (92.8)	3489 (73.5)
Some assistance with daily activities	142 (7.1)	1146 (24.1)
Total assistance with all daily activities	2 (0.1)	115 (2.4)
Very severe comorbidities*, n (%) [N=2080]		
Cardiovascular	6 (0.3)	64 (1.3)
Respiratory	22 (1.1)	233 (4.9)
Renal	35 (1.7)	93 (2.0)
Liver	5 (0.2)	44 (0.9)
Metastatic disease	8 (0.4)	56 (1.2)
Haematological malignancy	24 (1.2)	211 (4.4)
Immunocompromise	48 (2.3)	403 (8.5)
<b>Acute severity†</b>		
Mechanically ventilated within first 24h, n (%) [N=2204]	1392 (63.2)	2023 (42.6)
APACHE II Score [N=1964]		
Mean (SD)	14.6 (5.0)	17.1 (6.2)
Median (IQR)	14 (11, 18)	17 (13, 21)

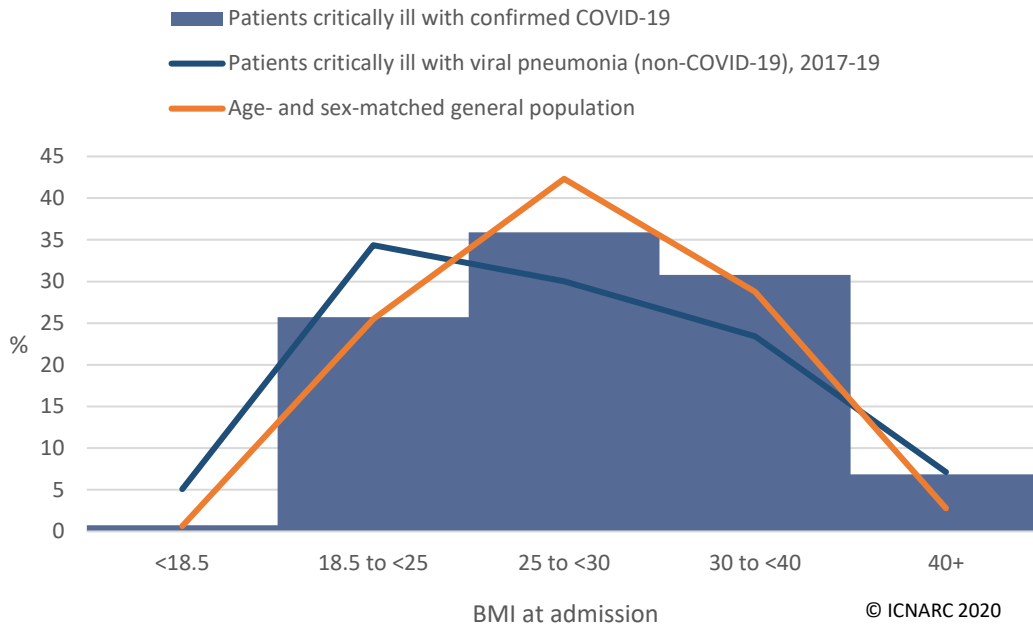
\* See Definitions on page 15; † Based on data from the first 24 hours following commencement of management by the critical care team.



**Figure 4 Age and sex distribution of patients critically ill with confirmed COVID-19**



**Figure 5 Ethnicity distribution of patients critically ill with confirmed COVID-19**



**Figure 6 BMI distribution of patients critically ill with confirmed COVID-19**

**Table 2 Characteristics of patients critically ill with confirmed COVID-19, by receipt of respiratory support\*‡**

Demographics	Patients receiving advanced respiratory support (N=383)	Patients receiving only basic respiratory support (N=158)
Age at admission (years) [N=541]		
Mean (SD)	63.4 (13.5)	60.2 (15.0)
Median (IQR)	66 (55, 74)	60 (50, 71)
Sex, n (%) [N=541]		
Female	100 (26.1)	46 (29.1)
Male	283 (73.9)	112 (70.9)
Currently or recently pregnant, n (% of females) [N=144]		
Currently pregnant	1 (1.0)	0 (0.0)
Recently pregnant (within 6 weeks)	2 (2.0)	1 (2.3)
Not known to be pregnant	97 (97.0)	43 (97.7)
Ethnicity, n (%) [N=491]		
White	224 (64.4)	100 (69.9)
Mixed	2 (0.6)	3 (2.1)
Asian	49 (14.1)	12 (8.4)
Black	59 (17.0)	21 (14.7)
Other	14 (4.0)	7 (4.9)
Body mass index, n (%) [N=498]		
<18.5	6 (1.7)	2 (1.4)
18.5-<25	94 (26.6)	42 (29.2)
25-<30	137 (38.7)	61 (42.4)
30-<40	94 (26.6)	35 (24.3)
40+	23 (6.5)	4 (2.8)
<b>Medical history</b>		
Dependency prior to admission to acute hospital, n (%) [N=511]		
Able to live without assistance in daily activities	322 (89.4)	122 (80.8)
Some assistance with daily activities	37 (10.3)	29 (19.2)
Total assistance with all daily activities	1 (0.3)	0 (0.0)
Very severe comorbidities*, n (%) [N=532]		
Cardiovascular	2 (0.5)	1 (0.6)
Respiratory	4 (1.1)	5 (3.2)
Renal	8 (2.1)	5 (3.2)
Liver	1 (0.3)	0 (0.0)
Metastatic disease	2 (0.5)	2 (1.3)
Haematological malignancy	6 (1.6)	7 (4.5)
Immunocompromise	10 (2.7)	4 (2.6)
<b>Acute severity‡</b>		
Mechanically ventilated within first 24h, n (%) [N=541]	319 (83.3)	10 (6.3)
APACHE II Score [N=505]		
Mean (SD)	16.3 (5.3)	13.9 (4.6)
Median (IQR)	16 (13, 19)	14 (11, 17)

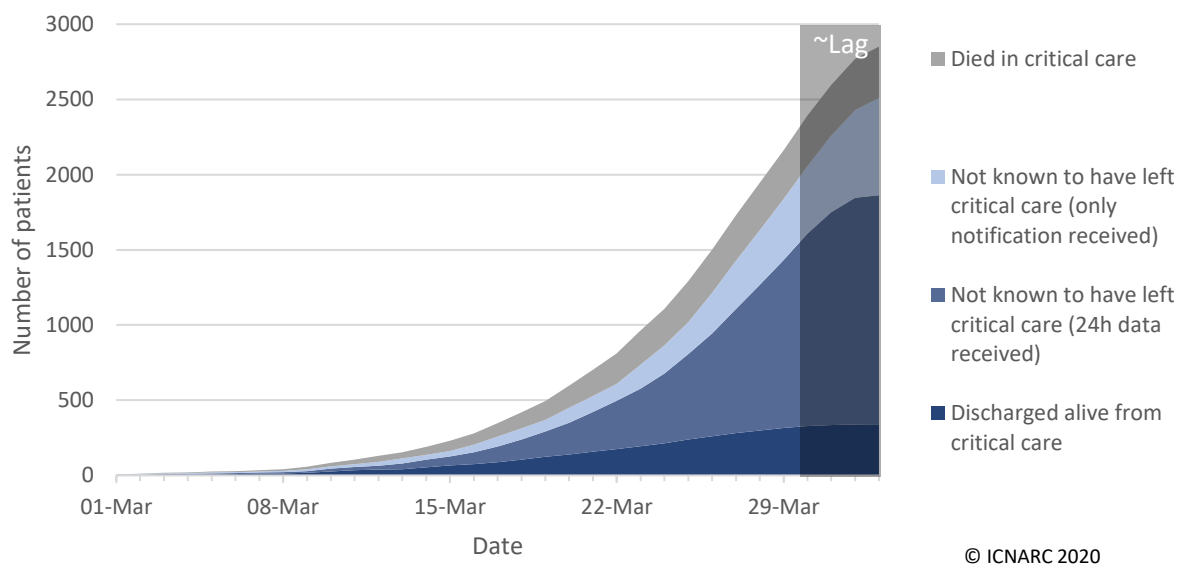
\* See Definitions on page 15; † Patients receiving no respiratory support excluded due to small numbers. ‡ Based on data from the first 24 hours following commencement of management by the critical care team.

## Outcome, length of stay and organ support

Critical care unit outcomes have been received for 680 patients, of whom 340 patients have died and 340 were discharged alive from critical care (Figure 7 and Figure 8). Lengths of stay and organ support are summarised in Table 3 and compared with those for patients critically ill with viral pneumonia (non-COVID-19) during 2017-19. Receipt and duration of organ support are summarised graphically in Figure 9 and Figure 10, respectively.

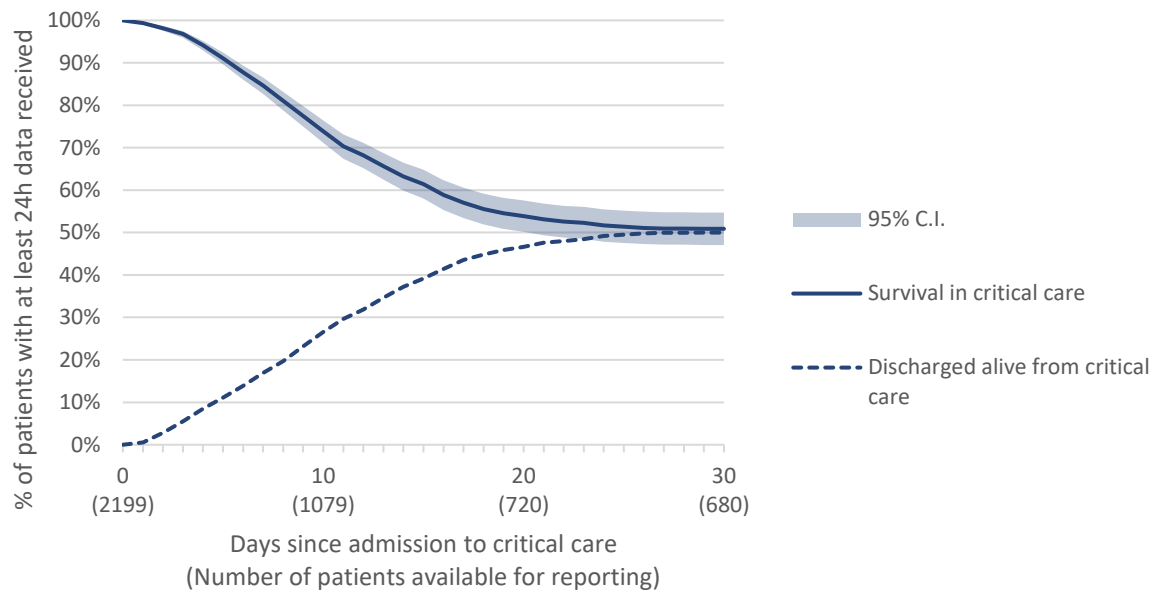
Note that Figure 8 will be biased towards longer durations due to lags in notification of patients' discharge or death, while Table 3, Figure 9 and Figure 10 will be biased towards patients with shorter durations due to the emerging nature of the epidemic. Figure 7 and Figure 8 assume that patients are still in critical care unless ICNARC have been notified otherwise, and Table 3, Figure 9 and Figure 10 include only those patients who have been discharged from critical care or who while receiving critical care.

Critical care outcomes for patients that received advanced respiratory support at any time during critical care compared with those that received basic respiratory support only are summarised in Table 4.



**Figure 7 Cumulative patient outcomes, by date**





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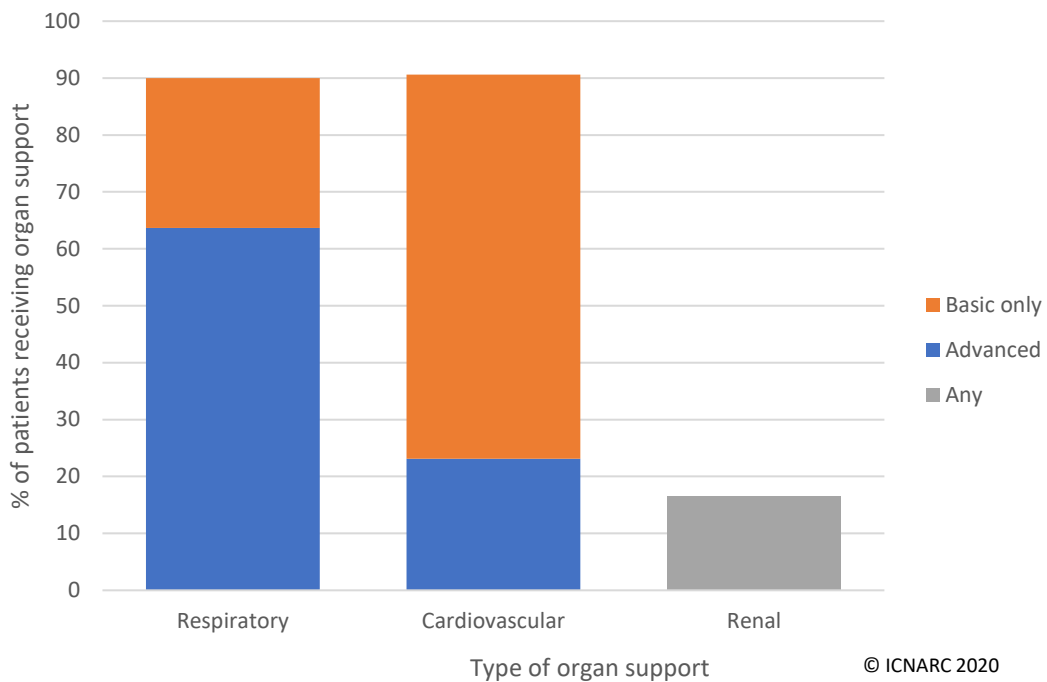
**Figure 8 30-day survival among patients with at least 24h data received**

Note: Owing to lags in notification of patients' discharge or death, this figure is expected to be biased towards longer lengths of stay in critical care.

**Table 3 Outcome, length of stay and organ support\* for patients admitted to critical care with confirmed COVID-19**

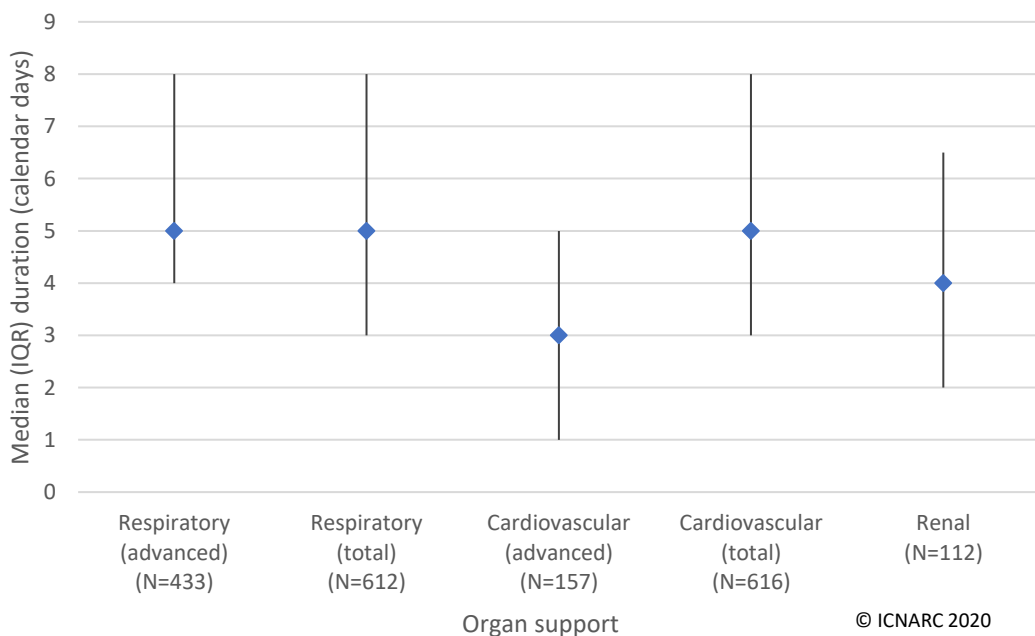
Critical care unit outcome	Patients with confirmed COVID-19 and critical care outcome reported (N=680)	Patients with viral pneumonia (non-COVID-19), 2017-19 (N=4434)
Outcome at end of critical care, n (%)		
Alive	340 (50.0)	3441 (77.6)
Dead	340 (50.0)	993 (22.4)
<b>Length of stay</b>		
Length of stay in critical care (days), median (IQR)		
Survivors	4 (2, 8)	6 (3, 12)
Non-survivors	5 (3, 7)	6 (2, 13)
<b>Organ support (Critical Care Minimum Dataset)*</b>		
Receipt of organ support, n (%)		
Advanced respiratory support	433 (63.7)	2054 (46.3)
Basic respiratory support	317 (46.6)	3602 (81.2)
Advanced cardiovascular support	157 (23.1)	944 (21.3)
Basic cardiovascular support	570 (83.8)	4103 (92.5)
Renal support	112 (16.5)	704 (15.9)
Liver support	1 (0.1)	35 (0.8)
Neurological support	34 (5.0)	241 (5.4)
Duration of organ support (calendar days), median (IQR)		
Advanced respiratory support	5 (4, 8)	8 (4, 17)
Total (advanced + basic) respiratory support	5 (3, 8)	6 (3, 12)
Advanced cardiovascular support	3 (1, 5)	3 (2, 5)
Total (advanced + basic) cardiovascular support	5 (3, 8)	6 (3, 12)
Renal support	4 (2, 6.5)	6 (3, 12)

Note: Owing to the emerging nature of the epidemic, the sample of patients with COVID-19 represented in this table is biased towards patients with *shorter* lengths of stay in critical care prior to discharge or death (i.e. those who died or recovered quickly). This does not apply to the comparison patients with viral pneumonia (non-COVID-19), 2017-19. \* See Definitions on page 15.



**Figure 9 Percentage of patients receiving organ support\***

Note: Owing to the emerging nature of the epidemic, the sample of patients with COVID-19 represented in this table is biased towards patients with *shorter* lengths of stay in critical care prior to discharge or death (i.e. patients who died or recovered quickly). \* See Definitions on page 15.



**Figure 10 Duration of organ support\* received**

Plot show median and interquartile range, in calendar days. Owing to the emerging nature of the epidemic, the sample of patients with COVID-19 represented in this table is biased towards patients with *shorter* lengths of stay in critical care prior to discharge or death (i.e. patients who died or recovered quickly). \* See Definitions on page 15.

**Table 4 Critical care outcomes by receipt of respiratory support\*†**

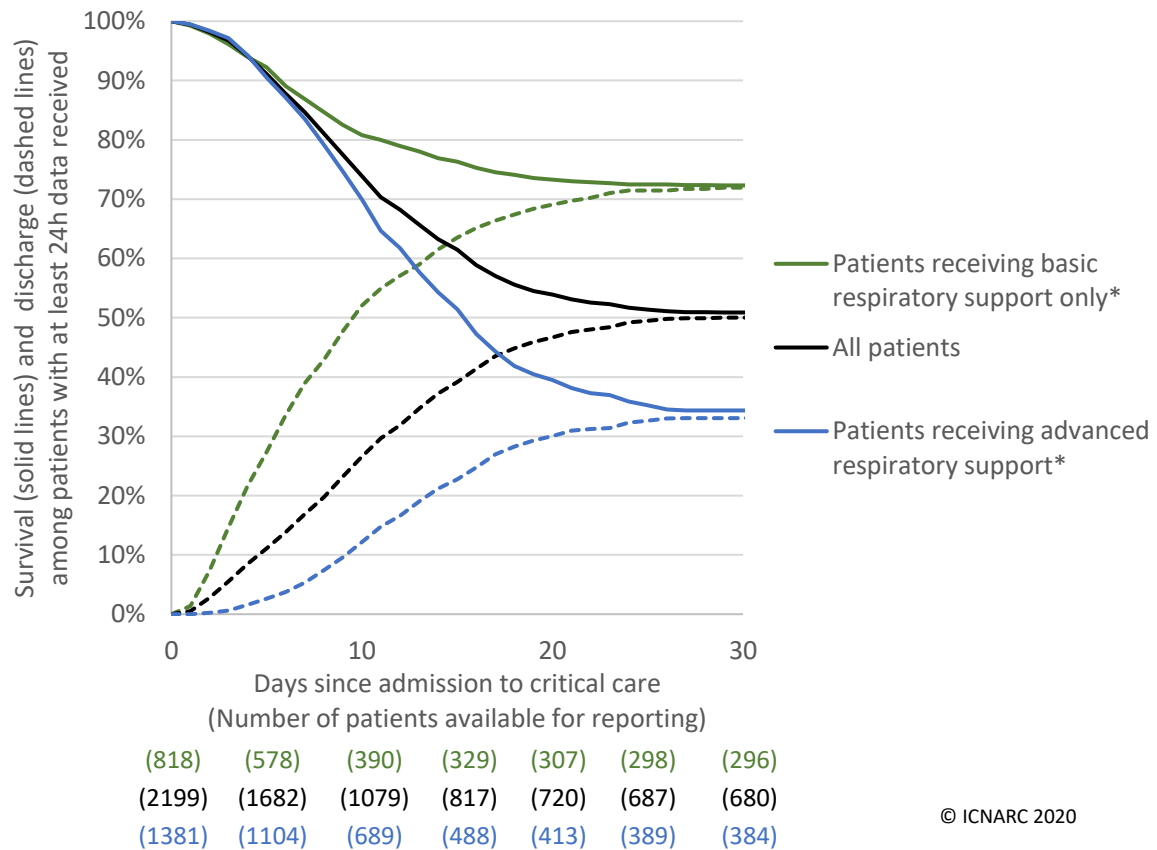
Critical care unit outcome	Patients receiving advanced respiratory support* (N=383)	Patients receiving only basic respiratory support* (N=158)
Outcome at end of critical care, n (%)		
Alive	127 (33.2)	132 (83.5)
Dead	256 (66.8)	26 (16.5)
<b>Length of stay</b>		
Length of stay in critical care (days), median (IQR)		
Survivors	7 (4, 10)	3 (2, 4)
Non-survivors	5 (3, 8)	2 (1, 3)
<b>Organ support (Critical Care Minimum Dataset)*</b>		
Receipt of organ support, n (%)		
Advanced respiratory support	383 (100.0)	- -
Basic respiratory support	126 (32.9)	158 (100.0)
Advanced cardiovascular support	128 (33.4)	7 (4.4)
Basic cardiovascular support	344 (89.8)	145 (91.8)
Renal support	92 (24.0)	8 (5.1)
Liver support	0 (0.0)	0 (0.0)
Neurological support	24 (6.3)	3 (1.9)
Duration of organ support (calendar days), median (IQR)		
Advanced respiratory support	6 (4, 9)	- -
Total (advanced + basic) respiratory support	6 (4, 9)	3 (2, 4)
Advanced cardiovascular support	3 (1, 5)	2 (1, 4)
Total (advanced + basic) cardiovascular support	6 (4, 9)	3 (2, 5)
Renal support	4 (2, 7)	3 (2, 4.5)

\* See Definitions on page 15. † Patients receiving no respiratory support excluded due to small numbers.

## Outcomes by patient subgroup

Figure 11 shows the 30-day survival for patients receiving advanced respiratory support at any time during critical care compared with those receiving basic respiratory support only.

The critical care unit outcomes for patients critically ill with COVID-19 across major patient subgroups are summarised in Table 4 and compared with those for patients critically ill with viral pneumonia (non-COVID-19) during 2017-19.



**Figure 11 30-day survival, by receipt of advanced respiratory support\*†**

\* See Definitions on page 15. † Patients receiving no respiratory support excluded due to small numbers.

**Table 5 Critical care outcomes by patient subgroup**

Patient subgroup	Patients with confirmed COVID-19 and critical care outcome reported		Patients with viral pneumonia (non-COVID-19), 2017-19
	Discharged alive from critical care n (%)	Died in critical care n (%)	Died in critical care (%)
Age at admission to critical care			
16-49	94 (77.0)	28 (23.0)	(10.4)
50-69	164 (53.9)	140 (46.1)	(23.4)
70+	82 (32.3)	172 (67.7)	(31.4)
Sex			
Female	106 (56.4)	82 (43.6)	(19.8)
Male	234 (47.6)	258 (52.4)	(24.6)
BMI			
<25	105 (55.9)	83 (44.1)	(23.9)
25 to <30	126 (53.8)	108 (46.2)	(24.3)
30+	81 (42.2)	111 (57.8)	(18.3)
Assistance required with daily activities			
No	288 (52.1)	265 (47.9)	(20.1)
Yes	30 (38.0)	49 (62.0)	(29.0)
Any very severe comorbidities*			
No	302 (50.9)	291 (49.1)	(19.8)
Yes	29 (42.0)	40 (58.0)	(34.5)
Respiratory support*†			
Basic only	191 (38.1)	310 (61.9)	(11.8)
Advanced	192 (77.7)	55 (22.3)	(35.8)

Note: Owing to the emerging nature of the epidemic, the sample of patients with COVID-19 represented in this table is biased towards patients with *shorter* lengths of stay in critical care prior to discharge or death (i.e. those who died or recovered quickly). This does not apply to the comparison patients with viral pneumonia (non-COVID-19), 2017-19. \* See Definitions on page 15. † Patients receiving no respiratory support excluded due to small numbers.

## Definitions

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Very severe comorbidities:

- Cardiovascular: symptoms at rest
- Respiratory: shortness of breath with light activity or home ventilation
- Renal: RRT for end-stage renal disease
- Liver: biopsy-proven cirrhosis, portal hypertension or hepatic encephalopathy;
- Metastatic disease: distant metastases
- Haematological malignancy: acute or chronic leukaemia, multiple myeloma or lymphoma
- Immunocompromise: chemotherapy, radiotherapy or daily high dose steroid treatment in previous 6 months, HIV/AIDS or congenital immune deficiency

Organ support is recorded as number of calendar days (00:00-23:59) on which support was received at any time, using:

- Advanced respiratory: invasive ventilation, BPAP via trans-laryngeal tube or tracheostomy, CPAP via translaryngeal tube, or extracorporeal respiratory support
- Basic respiratory: >50% oxygen by face mask, close observation due to potential for acute deterioration, physiotherapy/suction to clear secretions at least two-hourly, recently extubated after a period of mechanical ventilation, mask/hood CPAP/BPAP, non-invasive ventilation, CPAP via a tracheostomy, intubated to protect airway
- Advanced cardiovascular: multiple IV/rhythm controlling drugs (at least one vasoactive), continuous observation of cardiac output, intra-aortic balloon pump, temporary cardiac pacemaker
- Basic cardiovascular: central venous catheter, arterial line, single IV vasoactive/rhythm controlling drug
- Renal: acute renal replacement therapy, renal replacement therapy for chronic renal failure where other organ support is received
- Liver: management of coagulopathy and/or portal hypertension for acute on chronic hepatocellular failure or primary acute hepatocellular failure
- Neurological: CNS depression sufficient to prejudice airway, invasive neurological monitoring, continuous IV medication to control seizures, therapeutic hypothermia

## Acknowledgement

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Please acknowledge the source of these data in all future presentations (oral and/or written), as follows:

“These data derive from the ICNARC Case Mix Programme Database. The Case Mix Programme is the national clinical audit of patient outcomes from adult critical care coordinated by the Intensive Care National Audit & Research Centre (ICNARC). For more information on the representativeness and quality of these data, please contact ICNARC.”

## Table data appendix

**Table 6 Data underlying Figure 1, Figure 2, and Figure 7**

Date	Notified only	24h data only received	Discharged from critical care	Died in critical care
01/03/2020	3	3	1	1
02/03/2020	4	3	3	1
03/03/2020	5	4	5	3
04/03/2020	5	5	6	4
05/03/2020	7	6	7	6
06/03/2020	7	6	9	7
07/03/2020	7	7	12	8
08/03/2020	7	10	13	11
09/03/2020	13	12	17	16
10/03/2020	15	19	27	22
11/03/2020	18	22	35	30
12/03/2020	26	27	38	39
13/03/2020	33	38	42	42
14/03/2020	33	50	54	53
15/03/2020	36	60	66	68
16/03/2020	51	78	76	75
17/03/2020	67	105	87	89
18/03/2020	74	135	104	107
19/03/2020	78	168	124	124
20/03/2020	100	210	139	148
21/03/2020	106	264	158	176
22/03/2020	113	320	176	203
23/03/2020	160	383	194	227
24/03/2020	187	463	214	244
25/03/2020	214	567	240	271
26/03/2020	270	683	261	288
27/03/2020	321	826	281	303
28/03/2020	362	970	298	315
29/03/2020	405	1118	316	324
30/03/2020	449	1280	328	336
31/03/2020	508	1416	334	338
01/04/2020	583	1507	339	340
02/04/2020	648	1523	340	340