

ICNARC report on COVID-19 in critical care

04 April 2020

This report contains data on all confirmed COVID-19 cases reported to ICNARC up to midday on 03 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 2384 admissions of 2249 patients (Figure 1). Of the 2249 patients, 346 patients have died, 344 patients were discharged alive from critical care and 1559 patients were last reported as still being in critical care (Figure 2). The largest number of patients (949) 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).

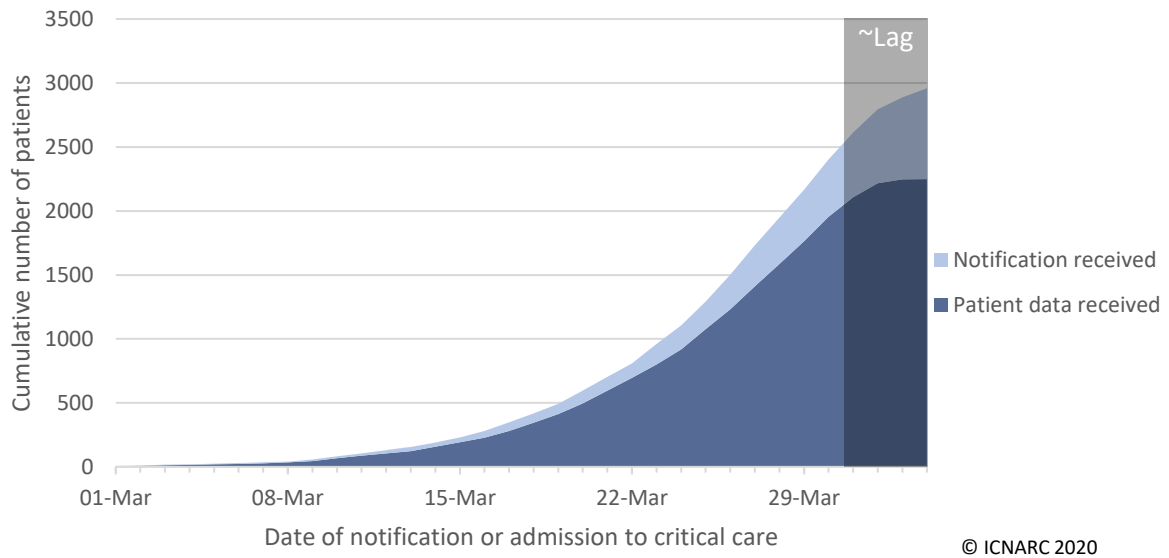


Figure 1 Cumulative number of patients critically ill with confirmed COVID-19 and 24h patient data received, by date of notification or admission to critical care

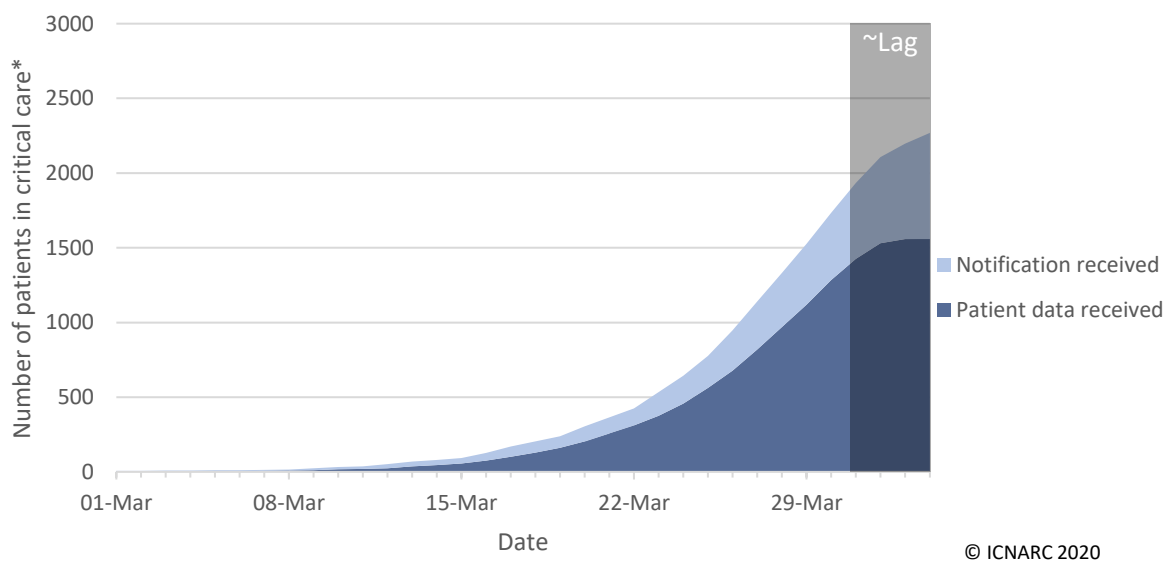


Figure 2 Number of patients critically ill with confirmed COVID-19, by date
 *Note: Patients for whom no outcomes have been received are assumed to remain in critical care as of 03 April 2020.

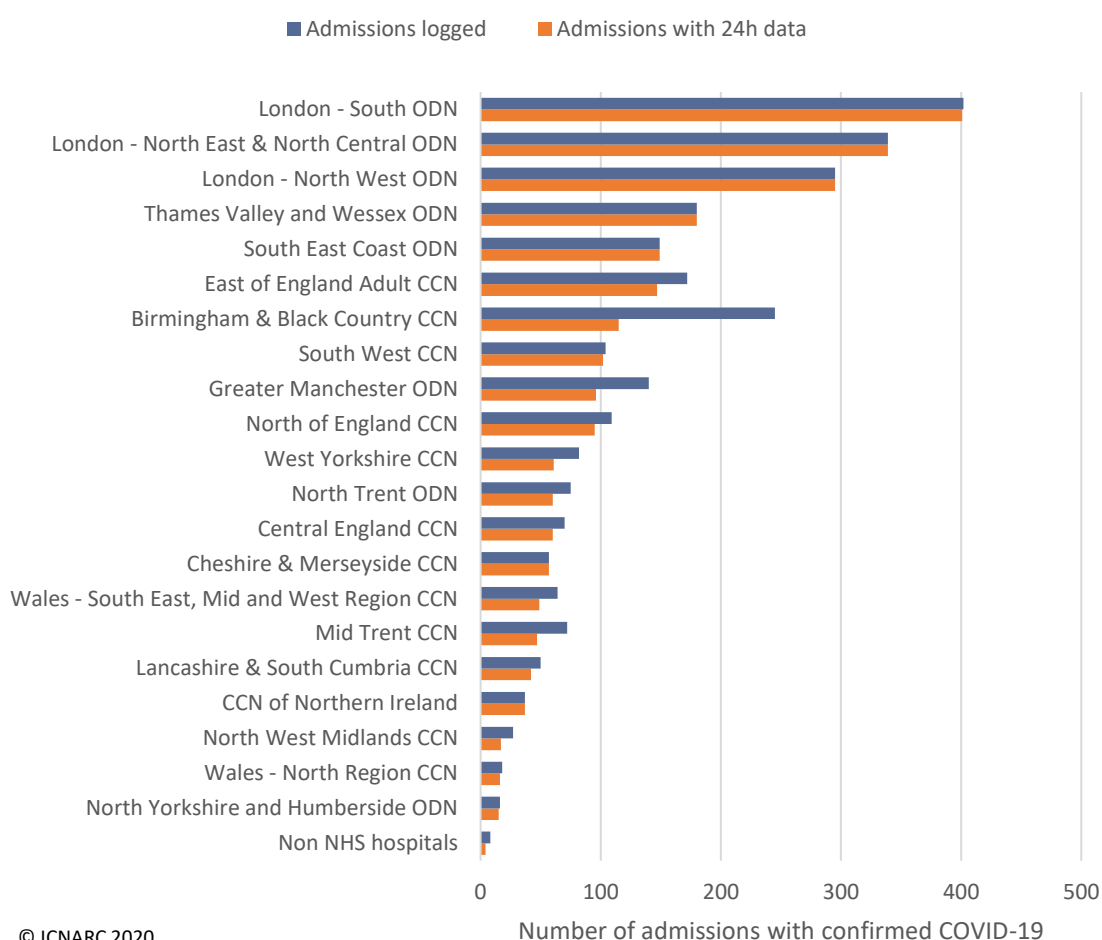


Figure 3 Admissions by Critical Care Network
 ODN: Organisational Delivery Network; CCN: Critical Care Network.

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 that received advanced respiratory support at any time during critical care and those that received 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=2249)		Patients with viral pneumonia (non-COVID-19), 2017-19 (N=4759)	
Age at admission (years) [N=2249]				
Mean (SD)	60.1	(13.1)	58.1	(17.4)
Median (IQR)	61	(52, 70)	61	(48, 71)
Sex, n (%) [N=2248]				
Female	607	(27.0)	2191	(46.0)
Male	1641	(73.0)	2568	(54.0)
Currently or recently pregnant, n (% of females) [N=581]				
Currently pregnant	2	(0.3)	40	(1.8)
Recently pregnant (within 6 weeks)	10	(1.7)	23	(1.0)
Not known to be pregnant	569	(97.9)	2128	(97.1)
Ethnicity, n (%) [N=1966]				
White	1273	(64.8)	4098	(88.8)
Mixed	23	(1.2)	41	(0.9)
Asian	272	(13.8)	262	(5.7)
Black	268	(13.6)	125	(2.7)
Other	130	(6.6)	91	(2.0)
Body mass index, n (%) [N=1926]				
<18.5	14	(0.7)	237	(5.1)
18.5-<25	498	(25.9)	1603	(34.4)
25-<30	688	(35.7)	1401	(30.0)
30-<40	592	(30.7)	1093	(23.4)
40+	134	(7.0)	332	(7.1)
Medical history				
Dependency prior to admission to acute hospital, n (%) [N=2046]				
Able to live without assistance in daily activities	1899	(92.8)	3489	(73.5)
Some assistance with daily activities	145	(7.1)	1146	(24.1)
Total assistance with all daily activities	2	(0.1)	115	(2.4)
Very severe comorbidities*, n (%) [N=2124]				
Cardiovascular	6	(0.3)	64	(1.3)
Respiratory	23	(1.1)	233	(4.9)
Renal	35	(1.6)	93	(2.0)
Liver	5	(0.2)	44	(0.9)
Metastatic disease	9	(0.4)	56	(1.2)
Haematological malignancy	24	(1.1)	211	(4.4)
Immunocompromise	49	(2.3)	403	(8.5)
Acute severity†				
Mechanically ventilated within first 24h, n (%) [N=2249]	1415	(62.9)	2023	(42.6)
APACHE II Score [N=2001]				
Mean (SD)	14.5	(5.1)	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.

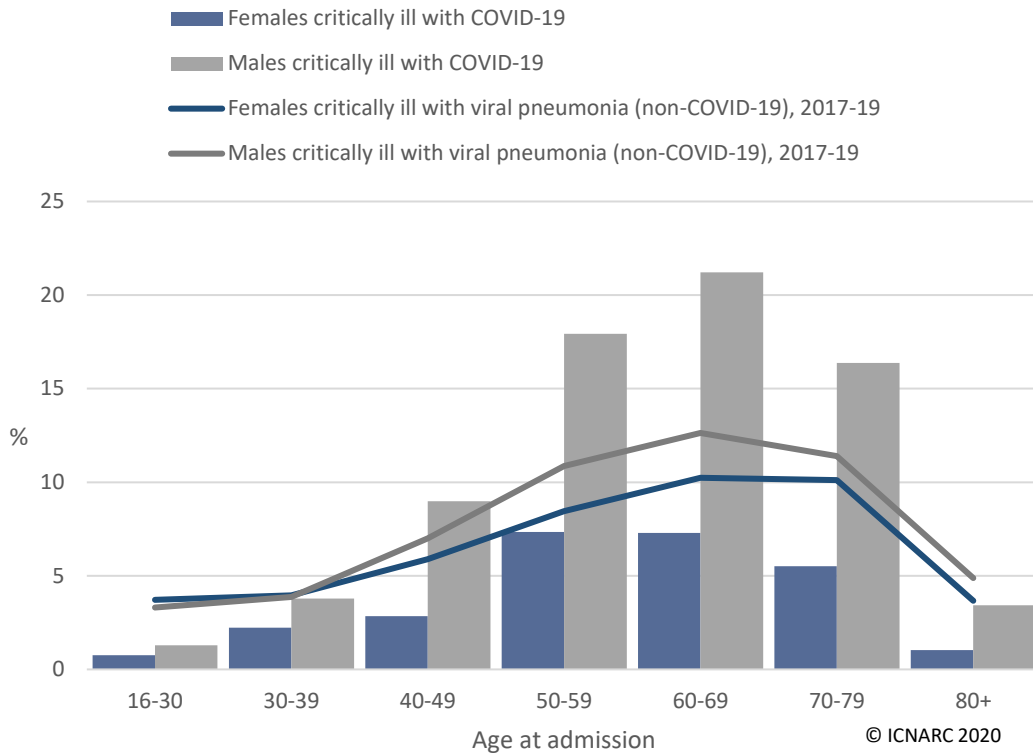


Figure 4 Age and sex distribution of patients critically ill with confirmed COVID-19

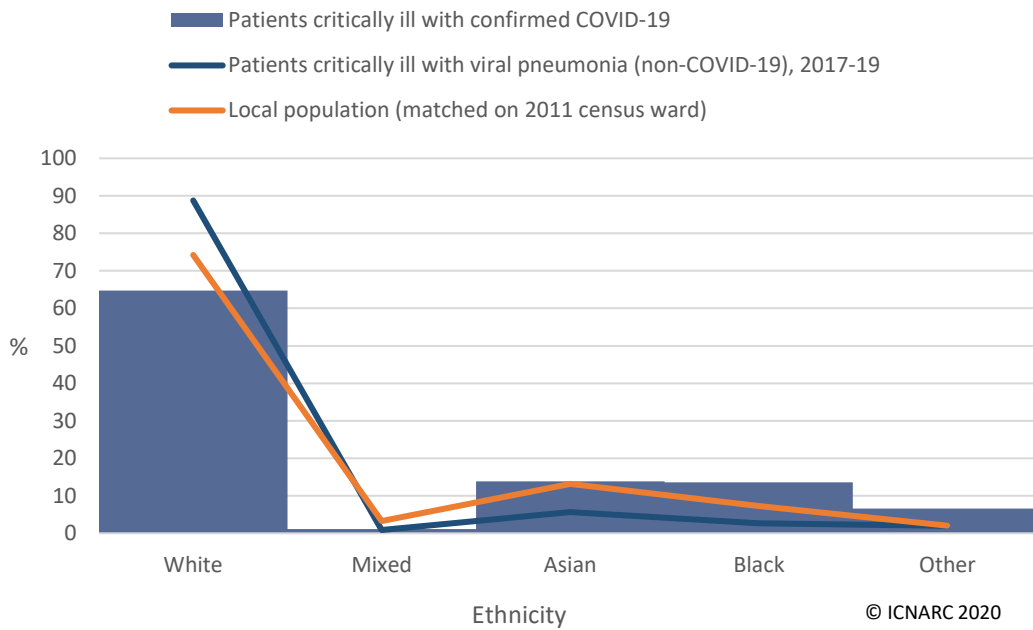


Figure 5 Ethnicity distribution of patients critically ill with confirmed COVID-19

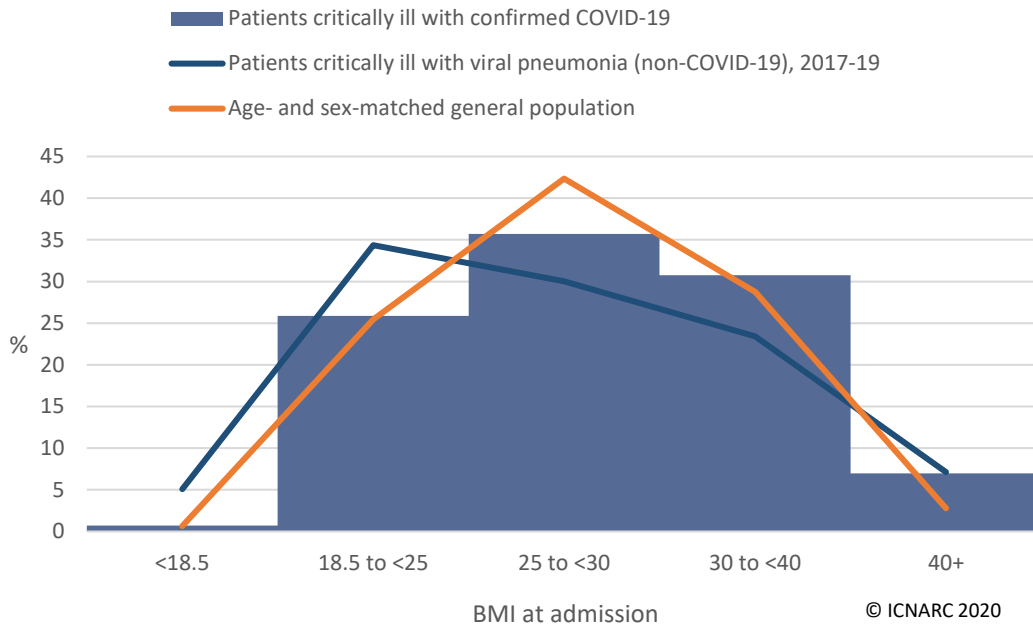


Figure 6 BMI distribution of patients critically ill with confirmed COVID-19

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

Demographics	Patients receiving advanced respiratory support (N=388)	Patients receiving only basic respiratory support (N=160)
Age at admission (years) [N=548]		
Mean (SD)	63.3 (13.5)	60.5 (15.0)
Median (IQR)	66 (55, 74)	61 (51, 72)
Sex, n (%) [N=548]		
Female	105 (27.1)	46 (28.8)
Male	283 (72.9)	114 (71.3)
Currently or recently pregnant, n (% of females) [N=150]		
Currently pregnant	1 (1.0)	0 (0.0)
Recently pregnant (within 6 weeks)	2 (1.9)	1 (2.2)
Not known to be pregnant	102 (97.1)	44 (97.8)
Ethnicity, n (%) [N=499]		
White	224 (63.3)	102 (70.3)
Mixed	1 (0.3)	3 (2.1)
Asian	51 (14.4)	12 (8.3)
Black	63 (17.8)	21 (14.5)
Other	15 (4.2)	7 (4.8)
Body mass index, n (%) [N=504]		
<18.5	6 (1.7)	2 (1.4)
18.5-<25	92 (25.8)	45 (30.6)
25-<30	138 (38.7)	62 (42.2)
30-<40	96 (26.9)	34 (23.1)
40+	25 (7.0)	4 (2.7)
Medical history		
Dependency prior to admission to acute hospital, n (%) [N=520]		
Able to live without assistance in daily activities	327 (89.3)	124 (80.5)
Some assistance with daily activities	38 (10.4)	30 (19.5)
Total assistance with all daily activities	1 (0.3)	0 (0.0)
Very severe comorbidities*, n (%) [N=540]		
Cardiovascular	2 (0.5)	1 (0.6)
Respiratory	5 (1.3)	5 (3.1)
Renal	8 (2.1)	5 (3.1)
Liver	1 (0.3)	0 (0.0)
Metastatic disease	3 (0.8)	2 (1.3)
Haematological malignancy	6 (1.6)	7 (4.4)
Immunocompromise	10 (2.6)	3 (1.9)
Acute severity‡		
Mechanically ventilated within first 24h, n (%) [N=548]	322 (83.0)	12 (7.5)
APACHE II Score [N=512]		
Mean (SD)	16.3 (5.4)	14.2 (4.4)
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 690 patients, of whom 346 patients have died and 344 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.

Due to the relatively low proportion of patients that have completed their critical care, all outcomes should be interpreted with caution.

Note that Figure 8 will be biased towards longer durations of critical care 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 of critical care due to the emerging nature of the epidemic. Figure 7 and Figure 8 assume that patients are still receiving 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 died while receiving critical care.

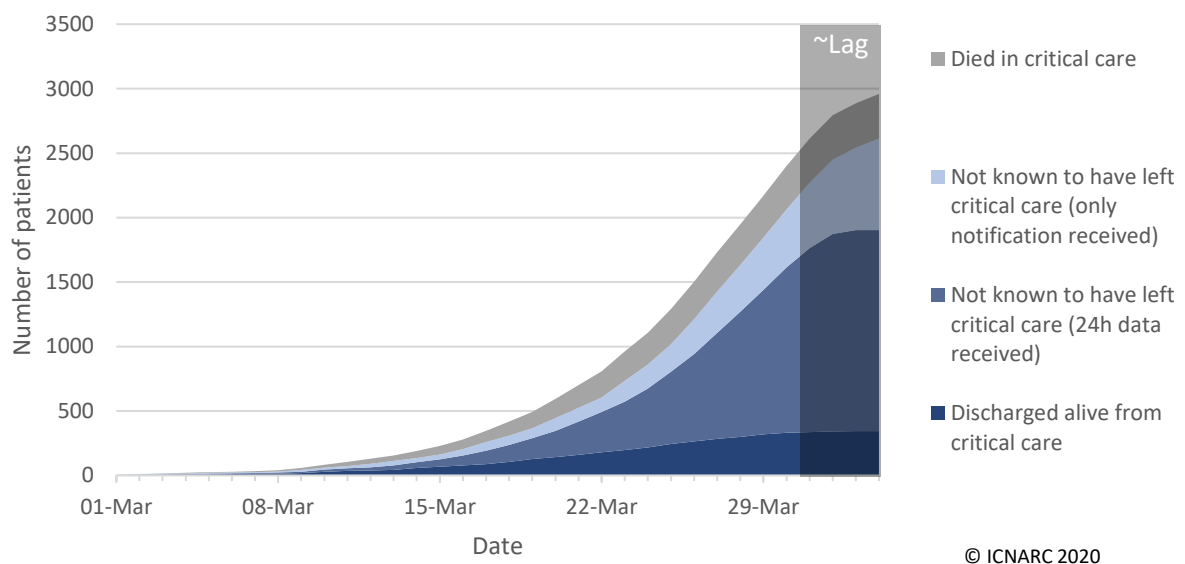
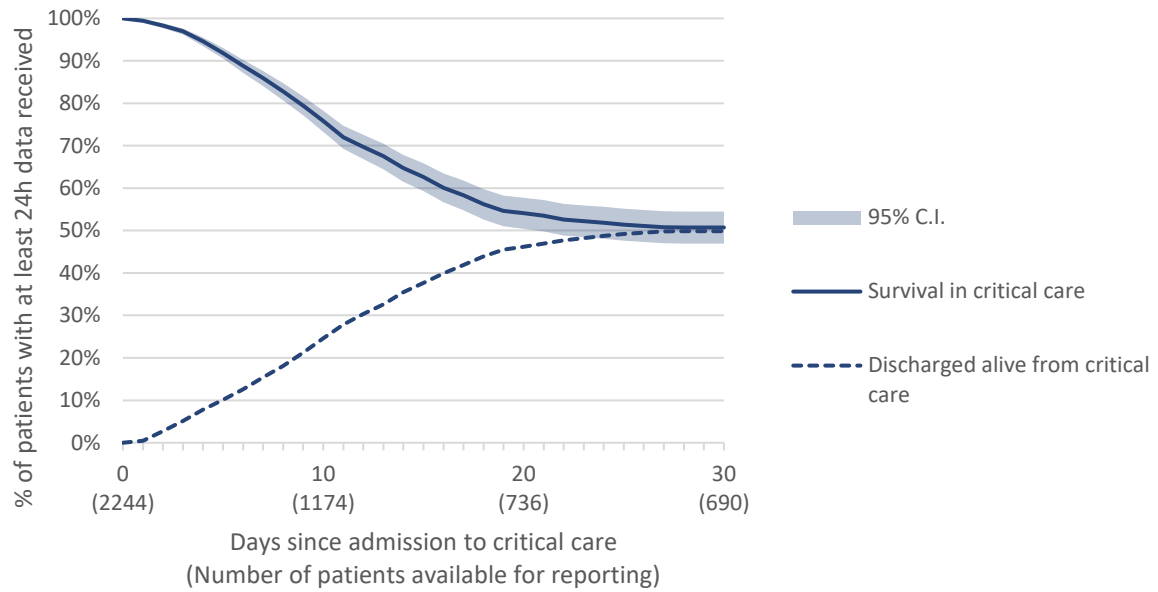


Figure 7 Cumulative patient outcomes, by date



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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* durations of critical care. Due to the relatively low proportion of patients that have completed their critical care, all outcomes should be interpreted with caution.

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=690)	Patients with viral pneumonia (non-COVID-19), 2017-19 (N=4434)
Outcome at end of critical care, n (%)		
Alive	344 (49.9)	3441 (77.6)
Dead	346 (50.1)	993 (22.4)
Length of stay		
Length of stay in critical care (days), median (IQR)		
Survivors	4 (2, 8)	6 (3, 12)
Non-survivors	5 (3, 8)	6 (2, 13)
Organ support (Critical Care Minimum Dataset)*		
Receipt of organ support, n (%)		
Advanced respiratory support	388 (67.2)	2054 (46.3)
Basic respiratory support	288 (49.9)	3602 (81.2)
Advanced cardiovascular support	143 (24.8)	944 (21.3)
Basic cardiovascular support	513 (88.9)	4103 (92.5)
Renal support	107 (18.5)	704 (15.9)
Liver support	0 (0.0)	35 (0.8)
Neurological support	26 (4.5)	241 (5.4)
Duration of organ support (calendar days), median (IQR)		
Advanced respiratory support	6 (4, 9)	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)	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* durations of critical care (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.

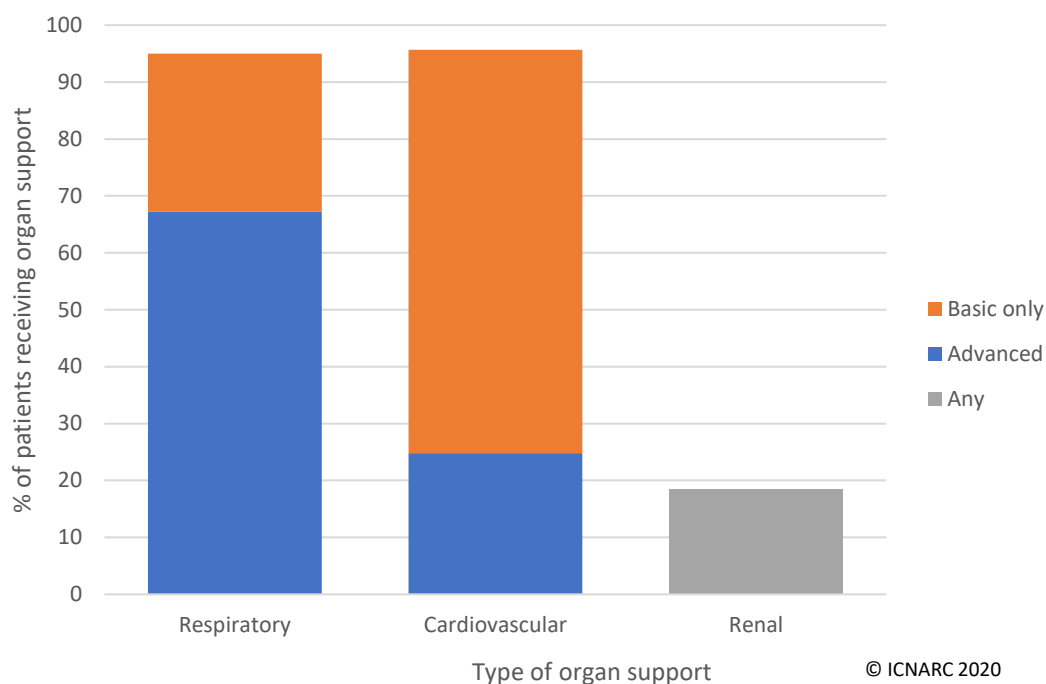


Figure 9 Percentage of patients receiving organ support*

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* durations of critical care (i.e. those who died or recovered quickly). * See Definitions on page 15.

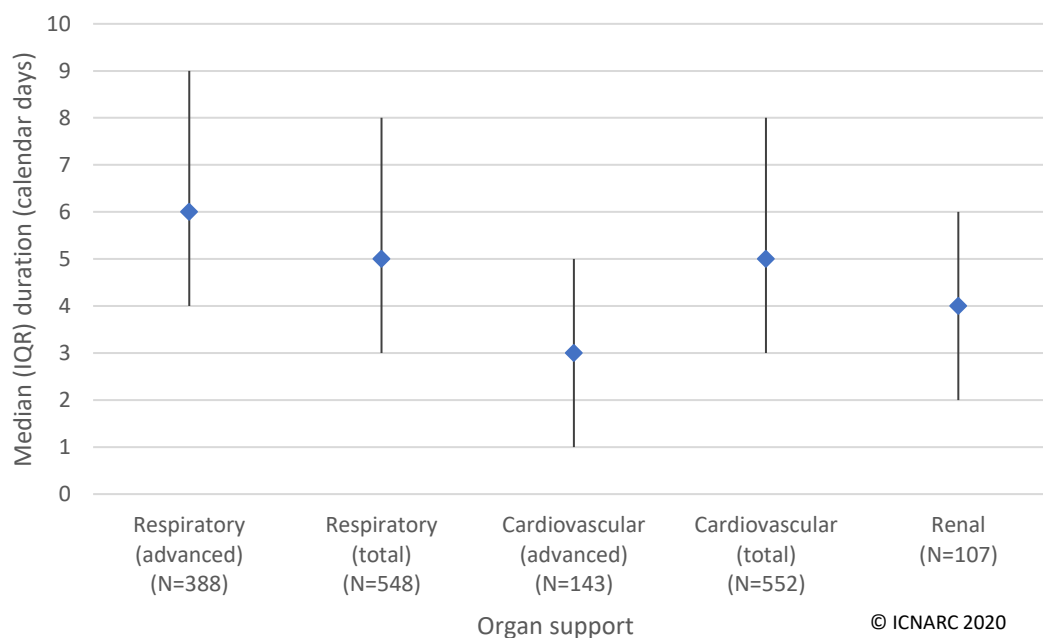


Figure 10 Duration of organ support* received

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

Outcomes by patient subgroup

Figure 11 shows the 30-day survival for patients that received mechanical ventilation during the first 24 hours in critical care compared with those that did not. 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.

The critical care outcomes for patients critically ill with COVID-19 across major patient subgroups are summarised in Table 5 and compared with those for patients critically ill with viral pneumonia (non-COVID-19) during 2017-19.

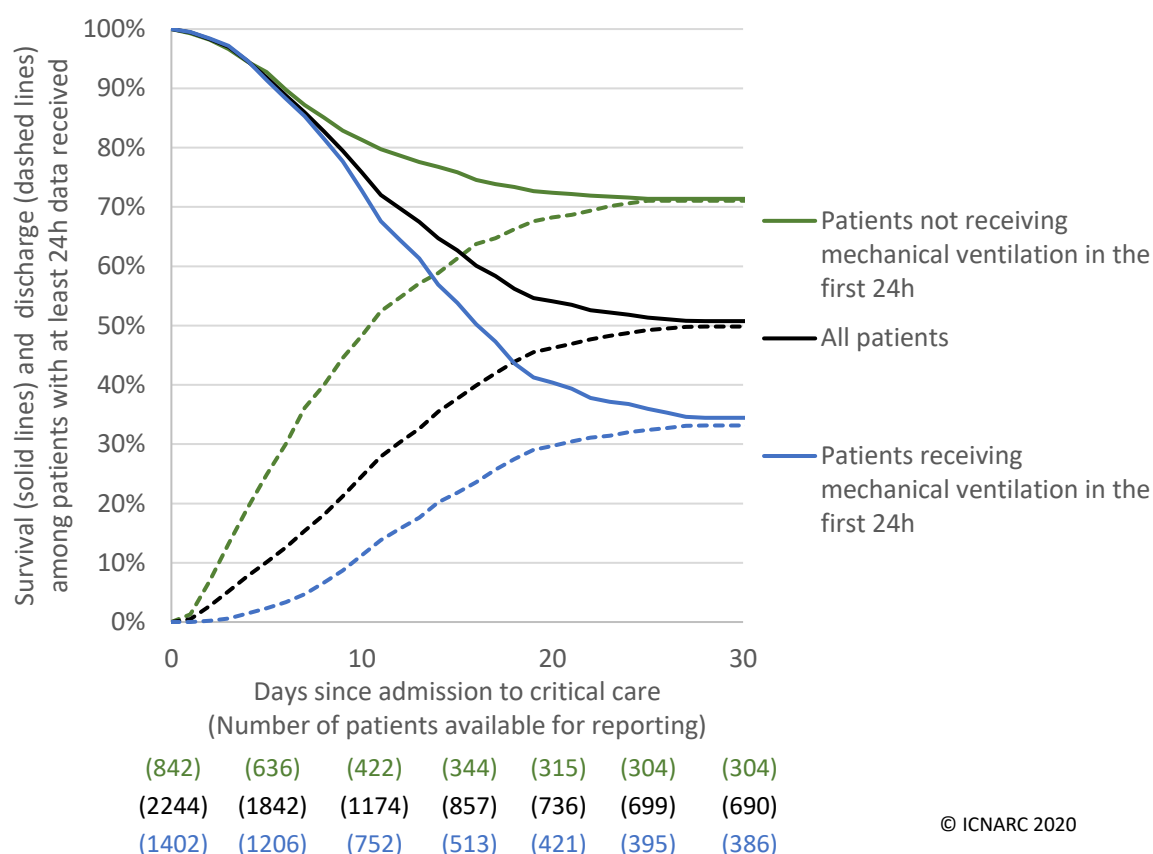


Figure 11 30-day survival, by receipt of mechanical ventilation during the first 24 hours in critical care

Note: Owing to lags in notification of patients' discharge or death, this figure is expected to be biased towards longer durations of critical care. Due to the relatively low proportion of patients that have completed their critical care, all outcomes should be interpreted with caution.

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

Critical care unit outcome	Patients receiving advanced respiratory support* (N=388)	Patients receiving only basic respiratory support* (N=160)
Outcome at end of critical care, n (%)		
Alive	127 (32.7)	134 (83.8)
Dead	261 (67.3)	26 (16.3)
Length of stay		
Length of stay in critical care (days), median (IQR)		
Survivors	7 (4, 10)	3 (2, 4)
Non-survivors	5 (3, 8)	2 (1, 3)
Organ support (Critical Care Minimum Dataset)*		
Receipt of organ support, n (%)		
Advanced respiratory support	388 (100.0)	- -
Basic respiratory support	128 (33.0)	160 (100.0)
Advanced cardiovascular support	133 (34.3)	8 (5.0)
Basic cardiovascular support	349 (89.9)	147 (91.9)
Renal support	93 (24.0)	9 (5.6)
Liver support	0 (0.0)	0 (0.0)
Neurological support	23 (5.9)	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, 3.5)
Total (advanced + basic) cardiovascular support	6 (4, 10)	3 (2, 5)
Renal support	4 (2, 7)	2 (2, 4)

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* durations of critical care (i.e. those who died or recovered quickly). * 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 (76.4)	29 (23.6)	(10.4)
50-69	168 (54.2)	142 (45.8)	(23.4)
70+	82 (31.9)	175 (68.1)	(31.4)
Sex			
Female	107 (55.4)	86 (44.6)	(19.8)
Male	237 (47.8)	259 (52.2)	(24.6)
BMI			
<25	106 (56.4)	82 (43.6)	(23.9)
25 to <30	127 (53.6)	110 (46.4)	(24.3)
30+	84 (42.4)	114 (57.6)	(18.3)
Assistance required with daily activities			
No	292 (51.9)	271 (48.1)	(20.1)
Yes	31 (38.3)	50 (61.7)	(29.0)
Any very severe comorbidities*			
No	307 (50.9)	296 (49.1)	(19.8)
Yes	29 (41.4)	41 (58.6)	(34.5)
Respiratory support* †			
Basic only	134 (83.8)	26 (16.3)	(11.8)
Advanced	127 (32.7)	261 (67.3)	(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* durations of critical care (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

Very severe comorbidities must have been evident within the six months prior to critical care and document at or prior to critical care:

- 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 translaryngeal 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

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	5	8	6
06/03/2020	7	5	10	7
07/03/2020	7	6	13	8
08/03/2020	7	9	14	11
09/03/2020	13	11	18	16
10/03/2020	15	18	28	22
11/03/2020	18	20	36	31
12/03/2020	26	25	39	40
13/03/2020	33	36	43	43
14/03/2020	33	46	57	54
15/03/2020	36	57	69	68
16/03/2020	51	75	79	75
17/03/2020	67	102	89	89
18/03/2020	74	130	106	109
19/03/2020	78	161	127	126
20/03/2020	100	204	142	149
21/03/2020	106	258	161	177
22/03/2020	113	312	180	204
23/03/2020	160	375	198	228
24/03/2020	187	456	217	245
25/03/2020	214	562	243	272
26/03/2020	270	677	265	290
27/03/2020	321	820	285	305
28/03/2020	362	970	300	316
29/03/2020	405	1120	318	325
30/03/2020	449	1284	331	339
31/03/2020	507	1426	337	343
01/04/2020	577	1530	342	346
02/04/2020	639	1558	344	346
03/04/2020	710	1559	344	346