icnarc intensive care national audit & research centre

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ICNARC report on COVID-19 in critical care

Royal Papworth Hospital Critical Care Unit

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This report presents analyses of data on patients critically ill with confirmed COVID-19 reported to ICNARC up to 4pm on 30 July 2020 from Royal Papworth Hospital Critical Care Unit. The report accounts for all patients with confirmed COVID-19 admitted to your unit and includes their original admission data (whether in your unit or in a previous unit), their total organ support (from all units) and final unit outcome (whether in your unit or in a subsequent unit).

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 critical care;
- resubmit data for the whole critical care stay, including critical care outcome and organ support, when the patient leaves critical care; and
- submit final data when the patient leaves acute hospital.

Admissions to critical care

To date ICNARC have received early data covering the first 24 hours of critical care for 105 admissions to critical care with confirmed COVID-19, either at or after the start of critical care, for 103 patients from Royal Papworth Hospital Critical Care Unit. Of the 103 patients, 93 have outcomes reported and 10 patients were last reported as still receiving critical care.

Patient characteristics

Characteristics of patients critically ill with confirmed COVID-19 in Royal Papworth Hospital Critical Care Unit are summarised in Table 1 and Table 2 and compared with patients critically ill with confirmed COVID-19 from all critical care units in the Case Mix Programme.

Table 1. Patient characteristics: demographics

Demographics	Patients with confirmed COVID-19 and 24h data	
	Royal Papworth Hospital Critical Care Unit (N=103)	All critical care units (N=10,624)
Age at admission (years) [N=102]		
Mean (SD)	52.0 (12.8)	58.8 (12.7)
Median (IQR)	51 (45, 62)	60 (51, 68)
Sex, n (%) [N=103]		
Female	25 (24.3)	3159 (29.8)
Male	78 (75.7)	7458 (70.2)
Currently or recently pregnant, n (% of females aged 16-49) [N=14]		
Currently pregnant	1 (7.1)	28 (3.7)
Recently pregnant (within 6 weeks)	0 (0.0)	40 (5.3)
Not known to be pregnant	13 (92.9)	692 (91.1)
Ethnicity, n (%) [N=98]		
White	67 (68.4)	6765 (66.2)
Mixed	5 (5.1)	186 (1.8)
Asian	13 (13.3)	1593 (15.6)
Black	8 (8.2)	981 (9.6)
Other	5 (5.1)	690 (6.8)
Index of Multiple Deprivation (IMD) quintile *, n (%) [N=89]		
1 (least deprived)	25 (28.1)	1400 (14.4)
2	22 (24.7)	1572 (16.2)
3	27 (30.3)	1912 (19.7)
4	12 (13.5)	2318 (23.9)
5 (most deprived)	3 (3.4)	2496 (25.7)
Body mass index *, n (%) [N=93]		
<18.5	0 (0.0)	77 (0.8)
18.5-<25	19 (20.4)	2581 (25.6)
25-<30	34 (36.6)	3466 (34.4)
30-<40	29 (31.2)	3163 (31.4)
≥40	11 (11.8)	794 (7.9)

* Please see Definitions on page 8.

Table 2. Patient characteristics: medical history and indicators of acute severity

Medical history	Patients with confirmed COVID-19 and 24h data	
	Royal Papworth Hospital Critical Care Unit (N=103)	All critical care units (N=10,624)
Dependency prior to admission to acute hospital, n (%) [N=99]		
Able to live without assistance in daily activities	97 (98.0)	9387 (89.7)
Some assistance with daily activities	2 (2.0)	1039 (9.9)
Total assistance with all daily activities	0 (0.0)	39 (0.4)
Very severe comorbidities *, n (%) [N=102]		
Cardiovascular	0 (0.0)	68 (0.6)
Respiratory	0 (0.0)	128 (1.2)
Renal	0 (0.0)	180 (1.7)
Liver	0 (0.0)	47 (0.4)
Metastatic disease	0 (0.0)	60 (0.6)
Haematological malignancy	0 (0.0)	201 (1.9)
Immunocompromise	0 (0.0)	367 (3.5)
Prior hospital length of stay [N=103]		
Mean (SD)	2.0 (4.3)	2.5 (6.3)
Median (IQR)	0 (0, 2)	1 (0, 3)
CPR within previous 24h, n (%) [N=102]		
In the community	1 (1.0)	58 (0.5)
In hospital	2 (2.0)	73 (0.7)
Indicator of acute severity		
Mechanically ventilated within first 24h *, n (%) [N=102]	60 (58.8)	6090 (58.8)
APACHE II Score [N=103]		
Mean (SD)	13.3 (4.3)	15.0 (5.3)
Median (IQR)	13 (11, 16)	15 (11, 18)
PaO_2 /FiO_2 ratio † (kPa), median (IQR) [N=100]	14.3 (10.5, 20.0)	15.8 (11.3, 22.2)
PaO_2 /FiO_2 ratio †, n (%) [N=100]		
$<$ 13.3 kPa ($<$ 100 mmHg)	43 (43.0)	3637 (36.8)
13.3-26.6 kPa (100-200 mmHg)	46 (46.0)	4731 (47.9)
$\geq$ 26.7 kPa ($\geq$ 200 mmHg)	11 (11.0)	1517 (15.3)

* Please see Definitions on page 8. Indicators of acute severity are based on data from the first 24 hours of critical care. † Derived from the arterial blood gas with the lowest PaO_2 during the first 24 hours of critical care.

The distribution of age and sex is presented in Figure 1. The distribution of ethnicity, matched on 2011 census ward for location of patients critically ill with COVID-19, is presented in Figure 2.

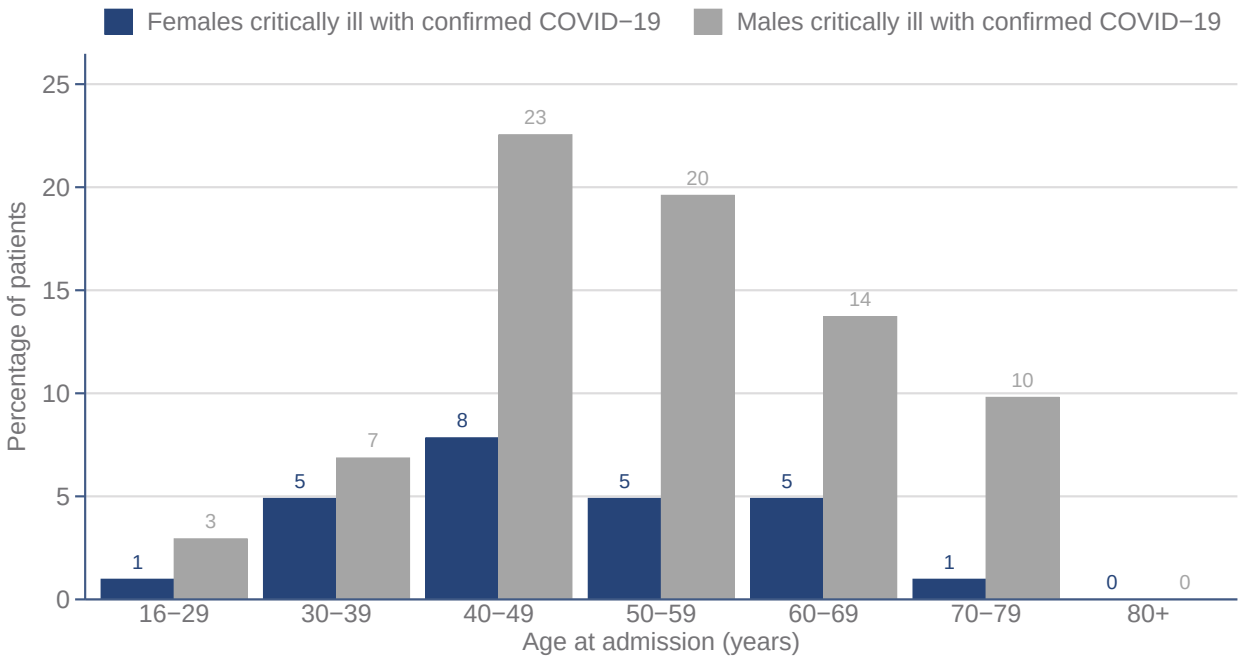

Figure 1. Age and sex distribution of patients critically ill with confirmed COVID-19

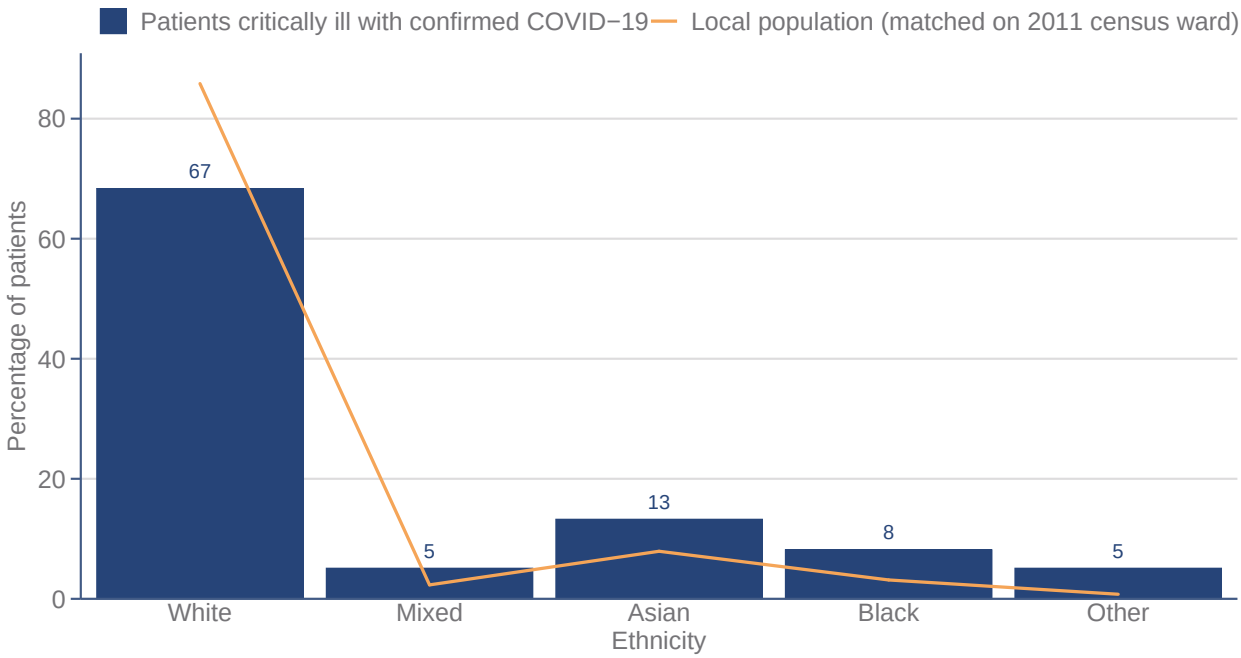

Figure 2. Ethnicity distribution of patients critically ill with confirmed COVID-19 compared with the local population (linked to 2011 census ward)

The distribution of Index of Multiple Deprivation (IMD) is presented in Figure 3. The distribution of body mass index (BMI), compared with an age- and sex-matched population (from the Health Survey for England 2018), is presented in Figure 4.

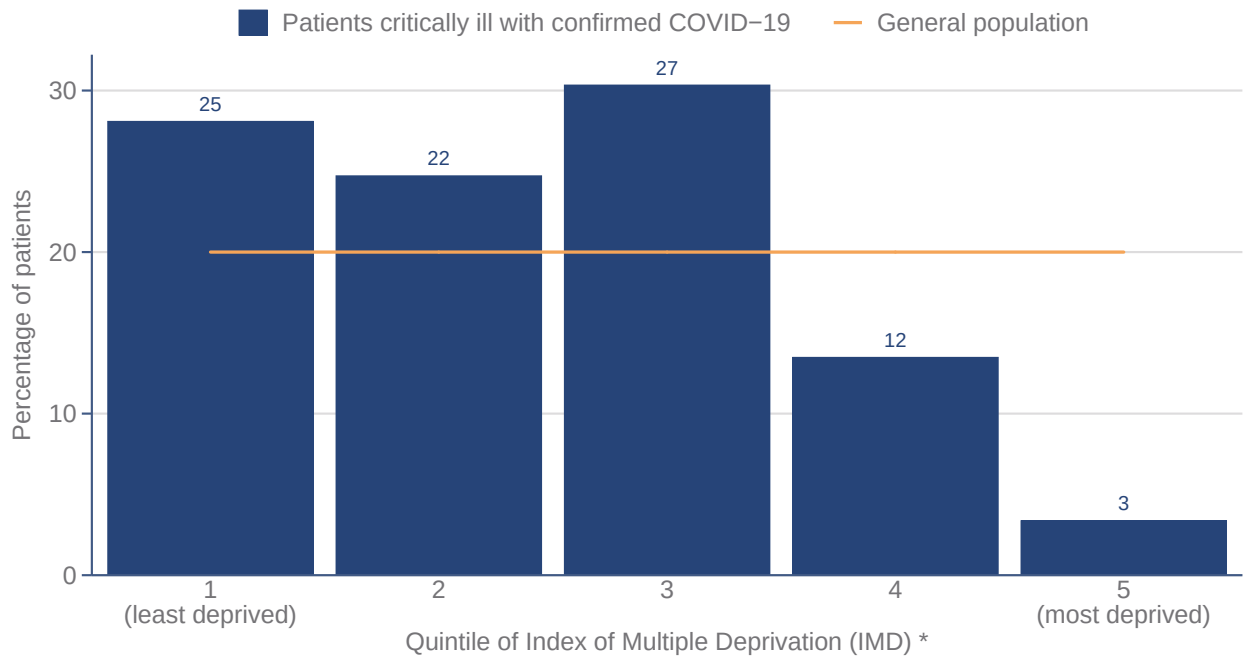

Figure 3. Index of Multiple Deprivation (IMD) * distribution of patients critically ill with confirmed COVID-19 compared with the general population

* Please see Definitions on page 8.

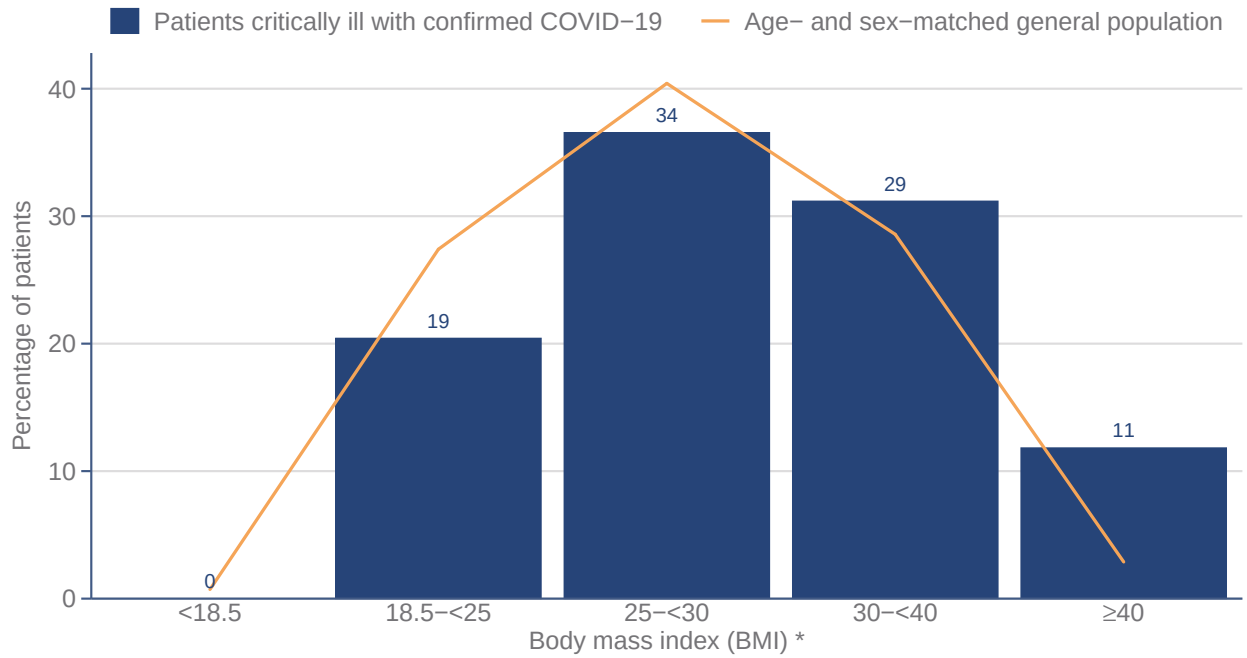

Figure 4. Body mass index (BMI) * distribution of patients critically ill with confirmed COVID-19 compared with the age- and sex-matched general population (Health Survey for England 2018)

* Please see Definitions on page 8.

Outcomes, duration of critical care and organ support

Critical care outcomes have been received for 93 (of 103) patients. Of these, 21 have died, 72 have been discharged from critical care and 10 were last reported to still be receiving critical care.

Critical care outcome, duration of critical care and organ support for patients critically ill with confirmed COVID-19 in Royal Papworth Hospital Critical Care Unit for whom critical care outcomes have been received are summarised in Table 3 and compared with patients critically ill with confirmed COVID-19 from all critical care units in the Case Mix Programme.

Table 3. Critical care outcome, duration of critical care and organ support

Critical care outcome	Patients with confirmed COVID-19 and outcome received	
	Royal Papworth Hospital Critical Care Unit (N=93)	All critical care units (N=10,341)
Outcome at end of critical care, n (%) [N=93]		
Discharged	72 (77.4)	6232 (60.3)
Died	21 (22.6)	4109 (39.7)
Duration of critical care		
Duration of critical care (days) †, median (IQR) [N=92]		
Survivors	28 (8, 47)	12 (5, 28)
Non-survivors	20 (14, 31)	9 (5, 16)
Organ support (Critical Care Minimum Dataset) *		
Receipt of organ support, at any point, n (%) [N=90]		
Advanced respiratory support	77 (95.1)	7425 (72.1)
Basic respiratory support	62 (76.5)	6975 (67.7)
Advanced cardiovascular support	43 (60.6)	3081 (29.9)
Basic cardiovascular support	87 (100.0)	9578 (92.9)
Renal support	40 (64.5)	2738 (26.6)
Liver support	0 (0.0)	104 (1.0)
Neurological support	5 (10.2)	898 (8.7)
Duration of organ support (calendar days), median (IQR) [N=90]		
Advanced respiratory support	21 (10, 35)	13 (7, 23)
Total (advanced + basic) respiratory support	25 (14, 37)	11 (5, 21)
Advanced cardiovascular support	3 (2, 7)	3 (2, 6)
Total (advanced + basic) cardiovascular support	29 (15.5, 42.5)	11 (5, 22)
Renal support	13.5 (6, 20.5)	8 (3, 15)

Please note that owing to the emerging nature of the epidemic, the sample of patients with confirmed 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. * Please see Definitions on page 8. † Duration of critical care is from original admission to critical care until final unit outcome and includes any time spent outside critical care areas (e.g. prior to any readmissions).

Outcomes by patient characteristics

Critical care outcomes for patients critically ill with confirmed COVID-19 in Royal Papworth Hospital Critical Care Unit across major patient subgroups are summarised in Table 4 and compared with patients critically ill with confirmed COVID-19 from all critical care units in the Case Mix Programme.

Table 4. Critical care outcome by patient characteristics

	Patients with confirmed COVID-19 and outcome received		
	Royal Papworth Hospital Critical Care Unit		All critical care units
Patient subgroup	Discharged alive from critical care n (%)	Died in critical care n (%)	Died in critical care (%)
Age at admission to critical care			
16-49	34 (81.0)	8 (19.0)	(18.9)
50-69	31 (75.6)	10 (24.4)	(40.4)
70+	7 (70.0)	3 (30.0)	(59.2)
Sex			
Female	18 (78.3)	5 (21.7)	(35.1)
Male	54 (77.1)	16 (22.9)	(41.7)
BMI			
<25	10 (58.8)	7 (41.2)	(40.5)
25-<30	23 (76.7)	7 (23.3)	(42.1)
≥30	32 (88.9)	4 (11.1)	(36.1)
Assistance required with daily activities			
No	67 (77.0)	20 (23.0)	(38.7)
Yes	1 (50.0)	1 (50.0)	(48.1)
Any very severe comorbidities *			
No	71 (77.2)	21 (22.8)	(38.7)
Yes	0 (.)	0 (.)	(50.2)
Any respiratory support *			
Basic only	4 (100.0)	0 (0.0)	(19.5)
Advanced	56 (72.7)	21 (27.3)	(48.0)
Any renal support *	25 (62.5)	15 (37.5)	(57.0)

Please note that owing to the emerging nature of the epidemic, the sample of patients with confirmed 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. * Please see Definitions on page 8.

Definitions

Index of Multiple Deprivation (IMD) is based on the patient's usual residential postcode (assigned at the level of Lower Layer Super Output Area) according to:

- English Index of Multiple Deprivation 2019 for postcodes in England
- Welsh Index of Multiple Deprivation 2019 for postcodes in Wales
- Northern Ireland Multiple Deprivation Measure 2017 for postcodes in Northern Ireland

Body mass index is calculated as the weight in kilograms divided by the height in metres squared. Weight and height values may have been measured or estimated.

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

- Cardiovascular: symptoms at rest
- Respiratory: shortness of breath with light activity or home ventilation
- Renal: renal replacement therapy 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 six months, HIV/AIDS or congenital immune deficiency

Mechanical ventilation during the first 24 hours was identified by the recording of a ventilated respiratory rate, indicating that all or some of the breaths or a portion of the breaths (pressure support) were delivered by a mechanical device. This usually indicates invasive ventilation; BPAP (bilevel positive airway pressure) would meet this definition but CPAP (continuous positive airway pressure) does not.

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

- Advanced respiratory: invasive ventilation, BPAP via trans-laryngeal tube or tracheostomy, CPAP via trans-laryngeal tube, extracorporeal respiratory support
- Basic respiratory: >50acute 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: central nervous system depression sufficient to prejudice airway, invasive neurological monitoring, continuous IV medication to control seizures, therapeutic hypothermia

