Outcomes for patients with COVID-19: known knowns, known unknowns, and unknown unknowns

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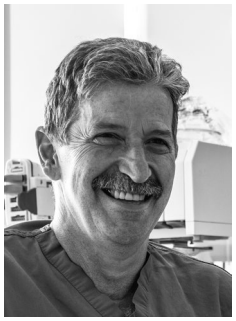
Adequate capacity — beds, equipment, consumables, and, crucially, trained personnel — is needed to cope with a surge of critically ill patients



In this issue of the *MJA*, Burrell and his co-authors report on the management and outcomes of patients with coronavirus disease 2019 (COVID-19) admitted to Australian intensive care units (ICUs) during February–June 2020.[1] The ICU mortality rate was impressively low (22% for patients requiring mechanical ventilation, 5% for those who did not). Given the excellent quality of care, it is worth exploring other reasons for this low mortality.

Known knowns include a median peak ICU bed occupancy rate of 14%, in most cases an ICU nurse-to-patient ratio of 1:1, the low national demand on ICU beds, and the relatively low number of patients requiring organ support. An Italian friend described his Milan ICU as a war zone; subsequent experience in the United Kingdom, particularly in the London region, was similar. By comparison, 44 Australian ICUs cared for 204 COVID-19 patients between 27 February and 30 June 2020,[1] whereas my ICU at University College Hospital in central London alone treated 152 patients with COVID-19 between 8 March and 23 May; further patients were managed by respiratory physicians in a hastily established respiratory high dependency unit that provided continuous positive airways pressure (CPAP), while an ICU at a separate site accepted our non-COVID patients. At the Australian peak, 90 patients required critical care;[1] at our peak, the usual critical care bed complement increased from 35 to 62, all filled by COVID-19-positive patients who were very challenging to manage. Nearly all required mechanical ventilation, as many had been transferred from local hospitals with even greater loads than ours. We resorted to ventilating patients experiencing severe respiratory failure with anaesthetic machines in operating theatres and recovery areas.

We also experienced significant shortages of standard sedative, neuromuscular blocking and anticoagulant drugs, infusion pumps, haemofiltration machines and filters, consumables, and non-invasive respiratory support devices. To help overcome this last shortage, we hastily manufactured CPAP devices for ourselves and other hospitals.[2] Crucially, we struggled with a lack of trained staff. Instead of our usual 1:1 nurse-to-patient ratio, at our peak each trained ICU nurse tended four patients, assisted by nurses largely unfamiliar with the sophisticated monitoring and support devices used in critical care. ICUs in smaller neighbouring hospitals were further stretched, operating at 1:6 ratios,

and some were even supported by dental receptionists and student nurses.

Among the known unknowns: what proportion of Australian patients had treatment ceilings because of underlying frailty or comorbid conditions that did not permit mechanical, let alone non-invasive, ventilation? This applied to one in eight patients who died in critical care in the UK,[3] and to larger proportions managed in non-ICU wards. Was illness severity comparable? In the UK, 58.1% of patients received invasive ventilation during their first 24 hours in intensive care, and most others needed CPAP or high flow nasal oxygen (HFNO).[3] In Australia, 39% of patients were mechanically ventilated, 26% received HFNO, and 2% received non-invasive ventilation during the first 24 hours in intensive care.[1] Renal replacement therapy was delivered to 26.7% of UK patients,[3] but to only 11% of Australian patients.[1]

What about the unknown unknowns? Across the first COVID-19 surge in the UK, and despite equivalent degrees of respiratory failure (worst arterial partial pressure of oxygen to fraction of inspired oxygen ratio) and APACHE II illness severity scores during the first 24 hours, the use of mechanical ventilation fell from 83.7% to 61.6% and that of renal replacement therapy from 31.5% to 22.9%; 28-day mortality fell by 21% (from 43.5% to 34.4%).[4] During the second UK surge, the use of mechanical ventilation (36.5% *v* 72.1% during the first surge), renal replacement therapy (11.5% *v* 26.8%) and vasopressors (15.3% *v* 30.8%) was lower still, despite similar illness severity scores.[5] My anecdotal experience is that patients are less brittle and disease progression less severe than during the first surge; colleagues in the UK, France and Spain have commented similarly. We don't know whether this difference relates to changes in management, despite solid trial evidence (eg, increasing use of non-invasive respiratory support and more liberal use of anticoagulation following recognition of the marked pro-thrombotic effects of COVID-19, especially in the lung[6,7]), temporal changes in pathogen virulence, or other factors. Notably, improvements in

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outcomes pre-date even the preprint publication of the RECOVERY dexamethasone trial results (22 June).[8] Although data are scanty and possibly unreliable, overall illness severity in Africa and Asia appears to be lower than in Europe and the Americas, judging by deaths as a proportion of population.[9]

Burrell and his colleagues rightly conclude by highlighting "the importance of ensuring adequate local ICU capacity."[1] However, as my discussion indicates, it is imperative that we have sufficient numbers of staff with the requisite skill sets, particularly nurses. Hospitals need to anticipate demand by training ward and recovery area nurses in critical care skills, perhaps by offering rotations from their normal departments. The same applies to trainee doctors and physiotherapists. The response by health care workers and the public during the first COVID-19 surge in the UK was both humbling and awe-inspiring. Whether staff energy levels and wellbeing can be maintained throughout further surges is an important problem that should be prospectively addressed. We need a strong psychological support system for health care workers, many traumatised by their experiences.[10,11] Australian health care workers have also been affected, despite fewer cases and a lower death rate than in other countries.[12]

Competing interests: I was involved with UCL, the UCL Hospitals NHS Foundation Trust, and Mercedes F1 in the development of a CPAP device (UCL Ventura) for use in patients with COVID-19 on a not-for profit, humanitarian basis.

Provenance: Commissioned; externally peer reviewed. ■

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