NSW hospital and Intensive Care Unit (ICU) Capacity and Surge Planning for the Delta epidemic 2021

Prepared by the ICU Working Group, with input from the wider OzSAGE group.

Background

Beds

There are an estimated [693 public hospitals and over 61,000 beds](#) in Australia, with [220 hospitals](#) in NSW with around 20,000 beds. The largest group of public hospital staff are nurses (42%), with salaried doctors comprising 12%. About 25% of public hospitals (179) are located in *Major cities*.

There are currently 608 public and 243 Private adult ICU beds (CHRIS database) and [47 Paediatric ICU](#) beds in NSW. At baseline 15-20% of ICU beds are available to deal with demand, including for non-COVID-19 conditions. [As of 11/9/21](#) there were 1164 COVID-19 patients in hospital and 221 in ICU in NSW.

Regional hospitals and people living in remote areas who do not have rapid access to hospital care are vulnerable, and as capacity in a stressed emergency care system is exceeded even in metropolitan areas delays in escalation of care contribute to excess mortality and morbidity. Deterioration can be rapid and unpredictable.

ICU

ICU care requires a well-trained team, consisting of ICU credentialed nurses, allied health workers and tiers of medical staff cooperating with interdependent skills in a designated, well-designed space with specialized equipment with which they are familiar and locally developed policies and procedures. Negative pressure rooms are preferred to minimise the risk of transmission of infection. The role of the patient and their supporters is recognized as part of the therapeutic alliance. The ICU functions cooperatively within its facility and more broadly within the health system. ICUs in Australia and New Zealand are connected and contribute to sophisticated databases to ensure benchmarking and internationally recognized outcomes and standards. The ability to provide ICU care and ventilation to all who require it reduces the case fatality rate. When ICU capacity is exceeded and required care cannot be provided to critically ill patients, the case fatality will rise. This was seen in [2020 in Europe](#), where the case fatality rate was much higher in countries with lower ICU capacity. A scenario where ICU capacity is exceeded in NSW will result in much higher case fatality rates than Australia has experienced to date.

Health workers

Health workforce is a limiting factor in the health system. The pandemic poses a high risk for health worker safety through occupational infection, with an [estimated risk of infection](#) for health workers almost three times that of the general public. In Victoria during the second wave in 2020, [over 4000 health and aged care workers](#) became infected. Poor guidelines which advised surgical masks for health workers treating COVID-19 patients were partly responsible, and were changed in Victoria during the second wave to N95 or P2 respirators. The national guidelines were changed in June 2021. Shortages of disposable N95 and P2 may occur during a surge as stock levels were determined in the past by old guidelines that limited the use of N95 respirators. During hospital outbreaks, many health workers need to be furloughed for quarantine, and are unavailable to work, thus exacerbating stress on the health system. It is therefore essential that health workers are maximally protected during the pandemic, for their own safety and for the resilience of the health system. Most health workers were vaccinated in February to March 2021, and fully vaccinated health workers have become infected (and in at least one case requiring ICU care) during the current epidemic in NSW. There is evidence that vaccine immunity, especially for [Pfizer,](#) [wanes](#) after 6 months. In a US health service, during the Delta surge from April, [130 of 227 infected health](#)

[workers (57.3%) were fully vaccinated](#), and vaccine effectiveness dropped from 90 to 65% between March and June.

Many countries are already recommending third dose boosters, and this is an urgent consideration for Australian health workers. In our recommendations, "healthcare worker" refers to anyone working in a clinical setting such as a hospital or clinic, even if they do not provide clinical care.

COVID –19 has impacted on ICU staff in dramatic ways and creates specific challenges for ICUs:

- A new disease which has the potential for health impacts on staff and their families
- The use of PPE which affects staff comfort and work-efficiency, and impedes ability to interact with patients and the environment. Emphasis and focus on PPE may impact on the ability to detect subtle clinical clues (impaired vision and fatigue)
- The loss of patient family support, and for paediatric intensive care patients, inability to have a parent at the bedside is challenging for care of the infant or child, even with use of virtual communication.
- Managing a new disease where rapid deterioration in previously well individuals may occur.
- Changes to routines such as social interaction during break time in tea rooms.

Staff have increased workload due to particular COVID related issues (prone of patients, increased demand for shift work due to staff furloughing). NSW is facing exit block (inability to discharge patients or free up beds) due to increasing demand for COVID ward beds. This also affects capacity for discharge of non-COVID patients. It also affects Emergency Medical Teams (cardiac arrest response) structure.

Surge planning

When baseline ICU capacity is exhausted (also known as "code black" and defined as more than about 900 patients requiring ICU care on a single day), plans have been created to extend ICU care outside the designated ICU physical environment. In reality surging ICU is a continuum with progressive dilution of resources and expertise and an increase in risks and likelihood of adverse outcomes. For example, patients who currently require high flow nasal prongs are managed in an ICU, but given the technology involved is not complex such patients could be managed in a ward setting, with greater risks to staff and patient safety. It is noted that the published ICU surge capacity to deal with COVID has been communicated to appease concerns and to decrease community anxiety regarding COVID -19. However, in other jurisdictions, [less than ideal solutions have been adopted](#) to compensate for lack of skilled staff to demands for surge capacity, which may reduce the quality of care.

The additional challenges involved in ICU surging into non designated areas and utilizing semi-skilled non-ICU staff include:

- Expert nursing ratios reduced and medical staff not familiar with ICU co-opted into the space, with an increase in adverse outcomes
- Unfamiliar environments and equipment
- Teams who have not worked together
- Increase in workload, stress, exhaustion and PPE breaches
- Physical limitations of existing ICU bedspaces including lack of adequate negative pressure beds, especially in regional hospitals.

Vaccination targets

It is proposed to relax restrictions such as lockdowns, movement restrictions and masks at a 70–80% vaccination rate for adults; this corresponds to 56–64% of the whole population. Without safe air strategies, Vaccine-Plus and higher vaccine uptake, reopening at these levels will result in a large surge of COVID-19, as seen in countries that lifted restrictions at about 60% whole population vaccination rates. Sydney is facing daily incident case numbers in the 1000s, which will increase the forecast cases and deaths after reopening.

Moreover, vaccination rates in the community are widely varied, as seen in regional and remote communities affected by the NSW epidemic. We must ensure thresholds for reopening are met for geographic and population sub-groups including Aboriginal and Torres Strait Islander people.

Ventilation and Vaccine-Plus are needed. Look at the difference between European countries that have taken this approach (addressing ventilation/safe indoor air and PLUS measures) compared to the UK, which has relied largely on vaccines:

Chart from https://ourworldindata.org/
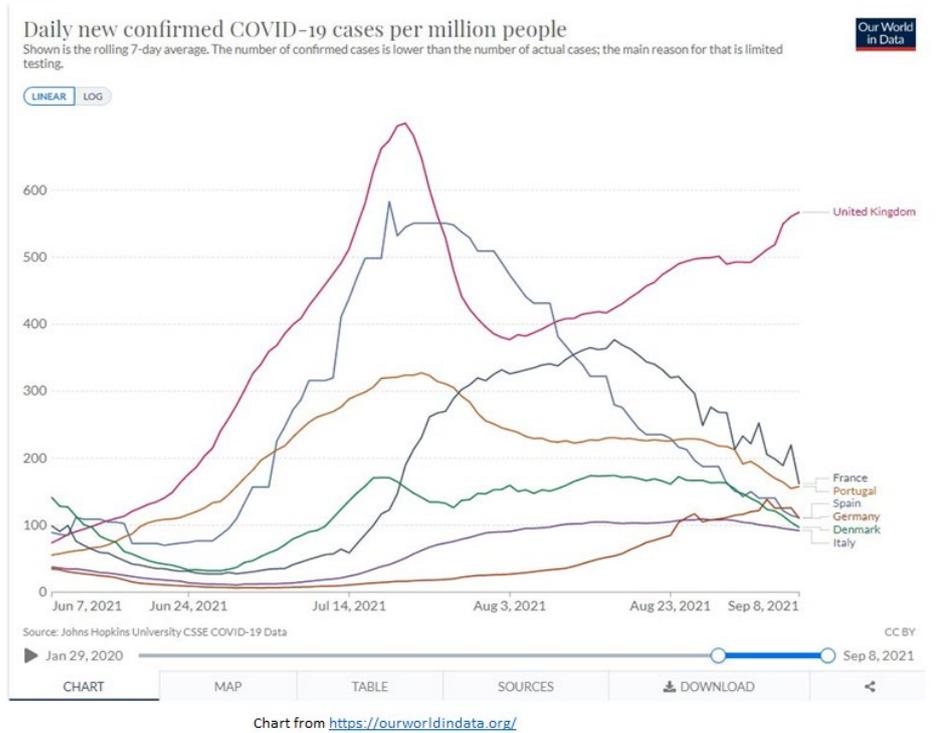
Modelling

UNSW modelling (shown in Appendix A) of hospital and ICU modelling projections shows that currently proposed roadmap of lifting restrictions in two stages (October and November) will result in a prolonged period (up to 5 weeks, including the Christmas and New Year period) of **code black** during which time care will be compromised, health workers endangered, and case fatality rate expected to rise. The scenarios which avoid code black altogether require that no further relaxation of restrictions occurs after October 18th, or that restrictions are only relaxed when the 80% target is met, with scaled up contact tracing. Scenarios show a second peak in cases occurring December 24-26th 2021, following relaxing of restrictions in October, or in January if restrictions are relaxed in November.

Recommendations:

- If relaxing restrictions on October 18th, and do not relax restrictions further in November after reaching the target of 80%.
- The best freedoms can occur when rapid contact tracing is scaled up and high levels of testing enabled.
- Restrictions could be decreased further if testing and rapid contact tracing could be massively scaled up with automated digital methods.
- Digital technology must urgently be sought for mass scale-up of contact tracing. OzSAGE has computer and data scientists who could offer advice.
- Regional areas with fully vaccinated rates <80% of 16 and over, should continue to have restrictions of travel into these areas to protect communities and their health systems.
- Disaggregated data on vaccination rates for Aboriginal communities in regional NSW are required prior to allowing travel into those areas. Vaccination rates for 2 doses in people 12 and over in these communities should be at least 85-90%.
- Protect health workers and provide timely 3rd dose mRNA vaccine boosters for health workers in patient care roles within 6-8 months of the second dose.
- Medical exemptions for vaccination are rare and must require formal documentation for access to permissions granted to vaccinated people.
- Protect all healthcare staff with maximal available measures including airborne PPE and increase stockpiles of airborne viral-level hospital and ambulance PPE stocks. Based on estimates for the health workforce in 2019, for NSW, we estimate at least 30 million disposable N95 or P2respirators for the first 100 days or 100,000 reusable forms of protection (such as elastomeric respirators and PAPRs) are required for NSW alone.
- Annual fit testing of respirators of all health workers be enforced.
- Reinforce hierarchy of controls to protect staff and patients from acquisition of infection and maximise staff protection utilising available engineering/source controls where appropriate (eg Medihoods, portable HEPA filters).
- Implement a range of strategies to bolster the existing clinical workforce to cope with increased illness and quarantine of staff and unsustainable increased workload. This includes recall of experienced nurses deployed to vaccination hubs back to clinical service and use of less skilled staff or student nurses for vaccination.
- A single administrative point of call for finding beds for COVID-19 and non-COVID-19 patients for regional hospitals and health systems.
- Implement strategies to maintain safe clinical services (for COVID-19 and for non-COVID patients) during the surge for ambulances, EDs, hospital wards, primary care and telehealth.
- Ensure that legislated work health and safety obligations are met in health care environments (including ambulances, EDs and wards). These should be safe for patients and for health care staff, for regional hospitals and non-clinical areas in all hospitals.
- Monitoring CO_2 in wards and areas of risk (corridors and tea rooms), optimising ventilation (safe air) and air flow, use of air purifiers (HEPA filters). We will provide separate advice on ambulances.
- Establish capacity to segment sections of beds into "COVID Pods" to segregate for safety from other patients.
- Facility Oxygen delivery/ pressure able to be maintained even in very high use scenarios.

- Explicit communication to the public of implications of surge in ICU, including rising case fatality rate and outcomes for non-COVID patients when care cannot be provided to everyone who needs it.
- Urgent plans for staff shortfall due to illness and quarantine (retired health workers, students, overseas trained clinicians).
- If unable to offer ICU admission based on capacity constraints, then a government-based mandate to protect facilities and health care workers is required. Transparent and accountable processes must be employed. Processes for appeal by patients and their families, and escalation must be available and documented.