Waikato District Health Board - Critical Care Unit

Improving the Critical Care Service to meet the needs of Te Manawa Taki

V10 7 December 2021

1 Introduction

By 2020 the population of Te Manawa Taki had risen to approx. 951,000 people. Despite this, commensurate growth in the Critical Care capacity at Waikato Hospital has not occurred. For more than eight years capacity had remained fixed at 15 intensive care (ICU) beds and 12 high dependency (HDU) beds. For the Waikato DHB population there are 3.5/100,000 ICU-level beds. This falls well short of the current national average of 6 beds per 100,000. There is currently underway a comprehensive review of National ICU capacity and service delivery which is due for submission to the Ministry of Health. This review suggests that nationally we should be working towards delivery of staffed bed capacity of 8-9 beds per 100,000.

The purpose of this document is to provide an outline of how the critical care service should be improved. A hospital and region of this size requires comprehensive high-quality critical care services to support:

- Cardiovascular services (cardiothoracic surgery, interventional cardiology, vascular surgery),
- Neurology & Neurosurgery,
- Regional Trauma service,
- Regional haematology/oncology services
- National services ie peritonectomy & HIPEC,
- A 24/7 critical care team to support inter hospital transport
- A Medical Emergency Team to support the wider hospital in detecting the deteriorating patient

This document proposes a development roadmap to provide a comprehensive high-quality critical care service fit for 2021 and beyond and which is sufficiently resilient to respond to the emergent health needs of the region.

2 Background

The Waikato DHB Critical Care Unit provides tertiary level care to Waikato DHB area residents and Te Manawa Taki. The Critical Care Unit currently consists of 16 Intensive Care Unit (ICU) level beds and 12 High Dependency Unit (HDU) level beds. ICU is a closed unit where patient management is by the intensivist team while HDU is an open unit where patient management is by the primary team.

The Critical Care Unit has 3.5 ICU-level staffed beds per 100,000 population (Waikato DHB population 428,000 people at 2017 census) if the unit is operating to the budgeted 16 staffed ICU beds at all times. This discounts any consideration of Waikato's tertiary unit duties to the Te Manawa Taki population (approx. 951,000 people total).

By way of comparison, the national target is 6 beds/100,000. Most other District Health Boards (DHBs) run at about 5.2 staffed ICU beds per 100,000, for example Capital & Coast has 7; Auckland DCC has 3.6 (but has a separate additional Cardiovascular ICU); Southern 5. The OECD average is 15.9 (ICU & HDU beds), Australia has 8.9 (ICU only); European average 11.5 (ICU only).

An equity discussion is also relevant in this area: 23% of the Waikato DHB population identify as Maori, compared to the national average of 16%.

3 Current context

The COVID-19 pandemic threat to New Zealand (and therefore to Waikato and to the greater Te Manawa Taki) through 2020 and 2021 has resulted in major efforts by the Critical Care team to vastly expand the number of ventilated ICU beds available to support our population. A COVID escalation plan could take the unit to a total of 33 beds across the MCC Level 4 floor, representing just over a doubling of current ICU capacity. This would be a temporary, "best-endeavours" situation, and an unsustainable one. The surge-preparation process has exposed deficiencies in the Waikato Critical Care capability. The key concern remains our ability to flex up in a sustainable manner.

There is a need to expand core ICU business to the patients who require this level of care, to maximise the capacity to accommodate the unmet needs of our population, and to retain surge capacity for potential COVID (or other) pandemic patients in the future. However, the resources currently available to the Critical Care Unit are inadequate to meet this required demand.

Current bed capacity

ICU has the physical capacity of 22 physical beds, however, until recently staffing resource had only been sufficient for 15 beds Monday – Friday and 13 beds over the weekends (despite weekends being peak times for trauma admissions for example). Medical and nursing staff were additionally sourced from this cover to resource a rapid response ICU retrieval team. We have recently commissioned six physical ICU bed spaces to enable our COVID readiness plans.

Recent decisions to make the Critical Care more sustainable and to enable our COVID readiness plans have resulted in approvals for:

- An additional 18.5 FTE Nursing staff from 1 July 2021, to resource to 16 ICU levels beds
- An additional 2 FTE SMO approved from 1 January 2021, to resource to 16 ICU levels beds
- A further 4 FTE SMO approved from 1 October 2021, to resource to 16 ICU levels beds

Resourced ICU beds are nominally allocated for post-surgical cardiac patients (6 beds), General Medical, Surgical and Paediatric patients requiring ICU level care (10 beds). We have recently commissioned six beds to manage COVID positive patients. However, we are resourced from a staffing perspective for 16 ICU level beds.

If the requirement for ICU level beds exceeds the number of resourced beds then planned surgery (Cardiac) may be cancelled. This is of concern as approximately 65% of cardiac cases are urgent (ie inpatients) rather than "elective" and thus delay is not in their best interests.

Our COVID readiness plans includes using the previously un-commissioned 6 bedded space which has been fully equipped but does not have a sustainable staffing model in place.

It should also be noted that the Waikato ICU has a ventilation rate in the 80% range which is higher than comparable units (approximately 60-70%) and reflects the bed constraints restricting access to the ICU for only the most critically unwell patients.

HDU has the physical capacity of 12 beds and is resourced at the maximum capacity of 12 beds daily. The total bed capacity has remained unchanged for many years and does not reflect the needs of a growing population. The average occupancy of the HDU beds is 84% 2019/ 2020 (this is most recent figures available as this data is manually collected).

The Waikato ICU operates at high-occupancy with low average LoS, indicating a "lean approach" to resource management. The corollary of this is that there are patients referred who are not accepted for ICU care, and thus may not be optimally supported. The challenge remains managing the complex and high risk cardiac surgical patients along with the peaks of demand for general beds when that occurs against the requirement of that same bed for a cardiac patient.

Current staffing capacity

Until 2012/13 the Critical Care Unit at Waikato Hospital was a 12 bed ICU and 12 bed HDU facility located on L3 of the Menzies Building. The HDU was relocated to the current location on L4 MCC in November 2012 followed by a 16 physical bed ICU in May 2013. There was a small increase in Registered Nursing (RN) FTE to recognise the larger footprint of the new Critical Care Unit. However, no change to the Medical staffing numbers occurred.

The RN staffing resources indicated above provided a staff matrix to open 13 ICU beds Monday – Friday, reducing to 11 beds at weekends. In July 2018 RN staffing numbers were increased to resource to 15 open ICU beds Monday – Friday, reducing to 13 beds over the weekend.

In 2017 the Resident Medical Officer (RMO) FTE budget was increased from 14 to 17 in recognition of ongoing resource constraint to meet Transport requirements. In July 2018 the Senior Medical Officer (SMO) FTE budget was increased from 8 to 9.5.

In January 2021 approval was given to recruit an additional 2.0 FTE of SMO and this was extended by a further 4.0 FTE in October 2021. An additional 18.5 FTE of Nursing staff was approved in July 2021. These newly approved positions are in the process of being recruited to.

There is currently underway a review of the SMO schedule / roster which will validate the number of SMO staffing required to safely staff the Critical Care 24/7. The Junior Medical staffing will need to be aligned to support the SMO roster.

Until recently there was a non-commissioned space that could accommodate six bed spaces. We have only recently equipped these six bed spaces to enable our COVID readiness plans.

The Critical Care budgeted FTE is:

Staff Type	Budgeted FTE July 2020		FTE approved to recruit to October 2021
Senior Medical Staff	9.5		15.5
Junior Medical Staff - Registrars	17.0		17.0
Junior Medical Staff - House Officers	4.0		4.0
Nursing Staff - ICU	93.3		111.8
Nursing Staff - HDU	42.4		42.4
ICU Technicians	3.0		3.0
Administration Staff	1.0		1
Total Critical Care budget FTE	170.2		194.7

The above staff are employed directly to the Critical Care Unit. However, there are staff such as Pharmacy, Social Work, Receptionist and Nurse Educators who have reporting lines outside the Critical Care unit who will also need to be reviewed and aligned.

Issues

What is our current Critical Care service?

There are a number of interfaces with other areas where the ICU provides what has been described as a "best endeavours" service. When the ICU is busy with core workload (general, cardiac, paediatric), the resources to address these other areas are limited and this could be described as "unmet need". This has a direct effect on other services. For example patients may remain in PACU or ED for many hours, or temporising measures may be taken, with admission to the open HDU as a consequence.

The current ICU size is inadequate for baseline population needs. This is further exacerbated by the need to preserve the limited resource of negative pressure rooms for potential COVID-19 patients (or those with other contagious diseases) for some time to come. With increasing Cardiac surgical throughput and complexity (high numbers of “High Risk” patients) and increasing demands and expectation to provide a regional Critical Care transport service, there is a need to review the Critical Care Medical and nursing FTE and rostering models. The current models across the ICU and HDU are both artificial and restrictive.

Considering the above constraints the ICU is unable to provide a full seven day a week service for Cardiac Surgery. Current management of the complex "high- risk" cardiac cases are only performed on Mon/Tues/Wed in order to reduce load in the latter half of the week and the weekend. Unfortunately high risk cases are often urgent, sometimes emergent, and are becoming increasingly frequent. The Cardiac Surgical Services Review 2018 identified this deficiency as a major shortcoming of the ICU capability.

It is worthy of note that despite the restrictions imposed by the recent crises of COVID, the WHDB cybersecurity incident, and paediatric RSV epidemic, an average of 55% of unit throughput since 01 July 2019 has been cardiac patients.

High Dependency Unit

The Waikato Hospital runs an ‘Open’ HDU model. This model means that the HDU is regularly over-subscribed due to the competition for resource from all adult specialties. The HDU utilisation is on average 50/50 between Medical specialties (including Renal, Haematology/Oncology and Infectious Disease) and Surgical specialties, including Neurosurgery, Vascular & Interventional Radiology, Thoracic and Spinal surgery. It is widely recognised that the current model is not working and requires review. It is also well recognised that the way that the HDU is currently run is inconsistent with contemporary HDU units in NZ in that there is a lack of direct Senior Medical Officer and Registrar oversight.

Post-surgical hypotension in PACU is common and part of the management of these patients is postoperative vasopressor therapy. Currently this may only be provided in ICU or PACU. If ICU is unable admit these patients (due to unavailability of beds) they may be stranded in PACU for extended periods of time or inappropriately discharge to a ward and fluid overloaded.

Transport

The Critical Care Transport service is currently being run as a best endeavours service and there are frequently times when we are unable to facilitate a transport due to insufficient staffing or air asset availability. Optimal care for a critically ill patient requiring inter-hospital transport dictates that this is

performed by a trained Critical Care Team. There is a project underway around Waikato DHB area Rural Hospital transports which Critical Care is involved in.

Management of the deteriorating patient outside ICU (MET team)

The reconfiguration of Critical Care Services for Waikato DHB provides an opportunity to develop a Medical Emergency Team (MET). This would be in line with all other tertiary hospitals in Australasia. Audit of current Waikato Hospital 99777 emergency calls demonstrates that the majority are "MET" calls and are not cardiac arrests in fact. This change has in part developed from the introduction of the national Early Warning Score charting system for detection of the deteriorating patient in 2017. Waikato Hospital systems are not well-established to support these MET events. It would be sensible to develop capability and to re-assign resources to staff such a team from the ICU SMO and RMO pool, along with Clinical Nurse Specialists (from the current Patient At Risk team). This improves patient safety on the wards and will support ward-based care.

Health Round Table data for cardiac arrest per 10 000 episodes has a mean of 47.7 compared with a peer group mean of 21.5 and this poor marker may be in part a failure to rescue without having an appropriate MET.

Paediatrics

Waikato ICU currently offers paediatric critical care (ICU or HDU) to children requiring such, under a shared-care model with the local SMO paediatricians, and support from the national Paediatric ICU team at Starship Hospital Auckland. At times this capability can be strained, due to bed constraints on the ICU (or conversely on a paediatric ward resulting in ICU exit-block). There is no dedicated paediatric HDU in the hospital and therefore children are admitted to ICU for both ICU and HDU care requirements.

Trauma / Neurosurgery

Trauma and Neurosurgical services at Waikato Hospital have continued to develop as patient volumes increase. It is worthy of note that no extra ICU resource accompanied the establishment of the neurosurgical service approximately 11 years ago, and no additional resource was provided with the introduction of the Midlands-wide pre-hospital Trauma Matrix, which appropriately aims to triage trauma patients to a destination hospital most likely to have the capability to provide definitive care. The net result is increased volumes of severe trauma patients being brought to Waikato (the regional tertiary centre), which has recently achieved RACS Level 1 Trauma Centre status. It should also be noted that these patients commonly have a long length of stay in the ICU and HDU.

4 Proposed future state

To address the issues outlined above and to sustainably equip, staff and run a Critical Care Unit model which would ensure capability for the future we are proposing a transition to a 34 bed and fully staffed ICU led model, consisting of -

- 10 beds in current ICU area.
- 6 cardiac beds managed as CVICU.
- 12 new ventilator capable beds in current HDU area
- 6 bed unit in what is currently the COVID area

It is anticipated that all beds would be fitted out as ventilator capable beds (although not all would have ventilators in the physical bed space on a daily basis ie they would be used as HDU level beds). The expectation would be that around 30% of the total beds would be used for patients that do not require ventilation (eg post op patients that require vasopressor support). Having all beds ventilator capable would allow significant flexibility for the future, and in particular for any future pandemic.

Intensivists have recognised knowledge and skills for caring for critically unwell patients. The scope of critically unwell patients at Waikato Hospital is diverse including complex cardiac surgical, poly trauma, neurosurgery, burns, adult and paediatric patients (including neonates who have been discharged from hospital, this is despite having no neonatal or paediatric ICU specialist). The demand requires the intensivists to work in manageable sized pods and the diversity means that those intensivists with sub speciality skills will need to be able to move between pods. Back up for technical skills is available from Cardiac and Paediatric Anaesthesia. However the breadth and density of work requires two intensivists to be scheduled out of hours seven days a week. Contemporary scheduling should be both safe and sustainable for all with no place for routine extended (24 hours) on site duty nor professional isolation.

Separating the Cardiac Intensive Care from General Intensive Care, HDU and other desired roles would facilitate a transition to achieving an adequate number of out of hours of critical care specialists. Interested incumbent Cardiac Anaesthetists, Surgeons and Intensivists could be recruited to staff a dedicated Cardiac ICU. The current case load of 1000 patients per annum would justify the existence of such a unit long term if deemed appropriate. Patients within the Cardiac ICU would need to be transferred to the care of Specialist Intensivists if not discharged within 72 hours or so. Internal recruitment has consequences for others to maintain current service delivery (e.g. Master Surgical Schedule), require investment (e.g. training/upskilling) and take time to implement (at least one year). The ongoing recruitment to achieve an appropriately staffed ICU would continue in parallel. A long term decision whether to integrate or keep the Cardiac ICU separate would need to be made.

This model would also require sufficient RMO, Nursing, Allied and support staff consisting of:

- Flexible nursing resource (including increased ACNMs, ACCESS and Nurse Educator roles)
- Increase Nurse Practitioner FTE
- Cross-skilling HDU/ICU nurses (training occurring - ventilated patient was recently treated in HDU)
- RMO cover per-pod (including Fellow-level trainees with sub-specialty interests)
- Increased allied healthcare staff (ICU Technicians, physio, pharmacy, dietician, etc)
- Increased administration/ reception support
- Options for enhanced Hospital MET/PAR team resource

Benefits of the proposed future state

- This plan would allow for two Consultant (SMO) teams to staff the Critical Care 24/7 (current ICU college guidelines suggest one team for up to 14 beds: 8-10 ventilated with 4-6 non-ventilated). It would enable improvement in the Cardiovascular Service, without compromising care for other patients requiring ICU.
- It would also allow significantly better ICU access for intubated and non-intubated patients for other services such as trauma and paediatrics.
- This option brings us closer to the national average of 6 ICU level beds per 100,000 of population at 5.1 staffed beds / 100k population for the Waikato region only.

- The options for a Regional comprehensive retrieval/transport team to support a tertiary hospital (work with other stakeholders eg ED/Phillips Trust/Midlands DHBs) need to be considered here.
- This plan enables an appropriately benchmarked HDU under the care of the Intensivists and a reliable and sustainable MET service for Waikato Hospital

There are hospital wide implications of this option for patients with a high acuity level who will not meet the revised Critical Care admission criteria requiring to be managed in the wards. The increased costs of RN and RMO resource would need to be considered as these patients require a higher nursing ratio than is currently provided on general wards. This model is currently being explored

5. Transitioning plan

The proposed future state will have cost, staffing and training implications which will require resourcing. These resourcing requirements will be addressed in the business case that follows. We propose a phased transition towards the future-proofed Critical Care Services, to allow appropriate staff, systems and infrastructure to be developed over time.

The phased transition to a closed HDU will require a whole of hospital approach given that a number of patients who would not meet the admission criteria of the closed HDU would need to be managed within the wards and this transition of care will need to be carefully coordinated.

Proposal for phased development:

Phase 1) 2022/23:

- Increase to 22 staffed ICU beds consisting of 10 existing general ICU beds, 6 existing CTU beds and 6 new ICU beds in the COVID area
- Increase SMO resource to run a 2 team model with 2 SMOs available 24/7
- Increase RMO resource to support the SMO team model
- Increase Nursing resource to staff the 6 bedded area currently allocated as the COVID end
- Increase resourcing of Allied and support staffing such as ICU technicians, physio, pharmacy, dietician, social worker and administration

Phase 2) 2023/24:

- Increase to 34 Critical Care beds by closing the "open" HDU area. By this time the wards should be adequately resourced to take post-operative patients. Some complex post-op patients would be managed in non-ventilated ICU beds.
- The increase SMO resource would allow development of a MET team and a 24 hour transport service
- Appropriate 24/7 staffing of HDU by RMOs and Nurse Practitioners

The transition planning is dependent on our ability to recruit staff in a timely manner.

6. Next steps

Request endorsement of this Future State Plan with agreement to proceed to Phase 1 of costed business case

Enhanced recruitment plan for agreed Nursing FTE (above the 18.5 agreed) and agreed 6 SMO FTE with constructive progress, including taking 0.4FTE for WDHB Aeromedical CD into the Critical Care matrix

Agreement on the future state of the Critical Care SMO roster modelling to allow 24/7 staffing with 2 SMOs minimum going forward

Agreed “trigger points” (eg opened bed numbers) that permit the recruitment of more SMO, RMO and Nursing staff (eg when increase from 22 to 28 beds and then 28 to 34 beds)

Agreed appropriate numbers of allied and support workforce staff (ICU technicians, physios, OT, pharmacy, dieticians, admin, kaitiaki, social work, clinical psychology, etc) to support the critical care expansion for the whanau of Te Manawa Taki.