Journal Pre-proof

Allied Health Surge Capacity in Australian Intensive Care Units During the COVID-19 Pandemic - A Cross Sectional Survey

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PII: S1036-7314(22)00190-4

DOI: https://doi.org/10.1016/j.aucc.2022.09.001

Reference: AUCC 847

To appear in: *Australian Critical Care*

Received Date: 7 June 2022

Revised Date: 27 August 2022

Accepted Date: 3 September 2022

Please cite this article as: Paykel M, Ridley E, Freeman-Sanderson A, Ramanan M, Booth S, Cook K, Ip K, De Gori M, Blackshaw J, Markham D, Downie S, Haines K, Allied Health Surge Capacity in Australian Intensive Care Units During the COVID-19 Pandemic - A Cross Sectional Survey, *Australian Critical Care*, https://doi.org/10.1016/j.aucc.2022.09.001.

during the production process, errors may be discovered which could affect the content, and all legal disclaimers that apply to the journal pertain.

CRediT statement:

Melanie Paykel: Conceptualisation, Methodology, Software, Validation, Formal analysis, Investigation, Resources, Data curation, Writing original draft, Writing – review and editing, All visualisation, Project administration. **Emma Ridley**: Conceptualisation, Methodology, Software, Formal analysis, Writing original draft, All visualisation. **Amy Freeman- Sanderson:** Conceptualisation, Methodology, Software, Formal analysis, Writing original draft, All visualisation. **Mahesh Ramanan:** Conceptualisation, Methodology, Software, Formal analysis, Writing original draft, All visualisation. **Sarah Booth:** Conceptualisation, Methodology, Software, Formal analysis, Writing original draft, All visualisation. **Katrina Cook:** Conceptualisation, Methodology, Software, Formal analysis, Writing original draft, All visualisation. **Kelvin Ip:** Conceptualisation, Validation, Formal analysis, Resources, Writing original draft, Writing – review and editing, All visualisation. **Mary De Gori:** Conceptualisation, Formal analysis, Writing original draft, , All visualisation. **Julia Blackshaw:** Conceptualisation, Formal analysis, Writing original draft, All visualisation, Supervision. **Donna Markham:** Conceptualisation, Formal analysis, Writing original draft, All visualisation, Supervision. **Sharon Downie:** Conceptualisation, Formal analysis, Writing original draft, All visualisation, Supervision. **Kimberley Haines:** Conceptualisation, Methodology, Software, Formal analysis, Investigation, Writing original draft, Writing – review and editing, Project administration

Author Agreement Statement:

We the undersigned declare that this manuscript is original, has not been published before and is not currently being considered for publication elsewhere. We confirm that the manuscript has been read and approved by all named authors and that there are no other persons who satisfied the criteria for authorship but are not listed. We further confirm that the order of authors listed in the manuscript has been approved by all of us. We understand that the Corresponding Author is the sole contact for the Editorial process. He/she is responsible for communicating with the other authors about progress, submissions of revisions and final approval of proofs.

Funding: This work was not funded.

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(QA2020.105. 71833).

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Abstract Word Count: 293

Manuscript Word Count: 313

CRediT statement:

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Funding: This work was not funded.

Abstract

Background: Based on the early international COVID-19 experience, it was anticipated that intensive care services and workforces in Australia would be placed under similar pressure. While surge capacity of medical and nursing workforces was estimated, little was known about baseline allied health staffing making it difficult to estimate surge capacity and coordinate planning. *Objectives:* The purpose of this study was to 1) capture baseline allied health staffing levels in Australian adult ICUs prior to the COVID-19 pandemic emergence in Australia; and 2) describe the allied health pandemic planning and surge response in Australian ICUs during the early waves of the pandemic. *Methods:* This was a cross-sectional, investigator-devised, prospective survey study. The survey was administered via the national chief allied health network to a convenience sample of senior ICU allied health clinicians at hospitals throughout Australia. *Results:* A total of 40 responses were received from tertiary and metropolitan hospitals; physiotherapists 12 (30%) and occupational therapists eight (20%) were the most frequent respondents. Prior to the COVID-19 pandemic, 28 (70 %) of allied health respondents had a mean (IQR) of 1.74 (2.00) full-time equivalent (FTE) staff designated to the ICU, where these ICUs had a mean of 21.53 (15.00) ventilator beds. Few respondents serviced their ICU on a referral-only basis and did not have dedicated ICU FTE 12 (20%). Surge planning was mostly determined by discussion within the ICU, allied health department, and/or respective disciplines. This approach meant that allied health staffing and associated decision-making was ad hoc at a local level. *Conclusions:* The baseline rate of allied health coverage in Australian ICUs remains unknown and the variability across allied health and within the specific disciplines is undetermined. Further research infrastructure to capture ICU allied health workforce data is urgently needed to guide future pandemic preparedness.

Introduction

The COVID-19 pandemic continues to have an unprecedented impact on public health globally with over 472 million cases and six million deaths, and 5-16% of patients requiring an intensive care unit (ICU) admission (1-4). Within Australia, the evolution of the pandemic initially differed to international experiences. During the initial COVID-19 wave in April 2020, the number of cases and hospital admissions were lower than anticipated. However, in the second wave (June to September 2020) case numbers, significantly increased with a greater strain on health services, although this was largely contained to Victoria. This pattern of COVID-19 cases in Australia provided policymakers with additional time at the beginning of the pandemic to plan a coordinated national and state-based public health response, including a range of public health measures to reduce infection transmission.

Based on the international COVID-19 experience, it was anticipated that intensive care services in Australia would be placed under immense pressure to care for the sickest patients during the pandemic - within finite resources. Australian ICUs rapidly developed a coordinated, and staged surge response to manage this increased bed demand and produced the Australia and New Zealand Intensive Care Society COVID-19 Guidelines. This increased service demand also required significant investment in critical care workforce planning and rapid up-skilling of alternate workforces to ensure adequate medical and nursing workforce capacity.

Surge capacity for medical and nursing staff was estimated at 325% and 365% respectively, above baseline (3). Equipment and beds were estimated at 120% and 191% respectively (3). Allied health, the third pillar of healthcare who typically work in Australian ICUs (5, 6), lacked data to describe baseline or ‘usual’ staffing models. This made it impossible to estimate surge capacity for allied health staff in ICU for the pandemic (7).

Given that allied health clinicians are essential team members to care for the critically ill, both during and after the episode of critical illness, such data were necessary to inform allied health surge staffing models. In order to effectively address the healthcare requirements associated with a pandemic across all aspects of patient care, recovery and rehabilitation also needs consideration (3, 7). The purpose of this cross-sectional survey was to generate new knowledge regarding the ICU allied health workforce models under ‘usual’ conditions and their planned surge capacity for the COVID-19 pandemic in

Australia. Such data can be used to inform future pandemic planning and resource allocation. Therefore, the aims of this study were to:

1. Determine baseline allied health staffing levels in Australian adult ICUs prior to the COVID-19 emergence pandemic in Australia (six months prior to 1 March 2020)

2. Describe the allied health pandemic planning and surge response to COVID-19 in Australian ICUs during the early waves of the pandemic (1 March 2020-1 March 2021).

Methods

The Checklist for Reporting Results of Internet E- surveys (CHERRIES) (Appendix 1) was used to report this study (8).

Study design

We used a cross-sectional, investigator-devised, prospective survey to collect data and designed the survey using established recommendations (9).

Ethical approval and informed consent process

The project was conducted in compliance with all stipulations of the designed protocol and ethical approval under the conditions of Western Health Low Risk Ethics Panel (QA2020.105. 71833).

Potential participants were provided with an email link to the survey and information sheet, including estimated time for completion (Appendix 2). On receiving and clicking the link, the participants were directed to information about the study, and in proceeding, informed consent was implied, with no added incentive. Once participants provided their responses and completed the survey, they were unable to withdraw as there was no way of tracking their response, as responses were non-identifiable. The collected data was only used for the purposes of this study.

Qualtrics, an online survey tool was used to create and administer the 21-question survey (Appendix 3) and manage the data. The Qualtrics survey link was disseminated via email only for this study.

Confidentiality and Security

This survey was anonymous, with no individually identifiable data collected. All aspects of data handling and storage were in accordance with approved ethical requirements.

Development and pre – testing

The investigator team was representative of the diverse ICU interprofessional team and comprised of allied health, medicine, and nursing clinician-researchers. A bespoke survey was purposively created, as there were no other suitable pre-existing surveys fit for purpose. We piloted this draft survey with a small group of allied health clinicians, incorporated their feedback, and ascertained time for completion. The survey was sent to 14 allied health clinicians for piloting, with a total of four responses received. After pilot testing, the estimated time for completion was approximately ten minutes. The majority of questions were multiple choice, for ease of completion, with space to further expand responses as relevant (Appendix 3)

Recruitment process and description of the sample having access to the questionnaire

A nonprobability sampling design was used as we could not estimate the chance of a given individual being included in the sample. This sampling approach can be used to study groups that may be challenging to identify – which is applicable to Australian allied health ICU clinicians. We established a list of the 157 adult ICUs in Australia. However, of the 157 adult ICUs (public and private) we did not know if allied health staff were present in all ICUs, and if so, which disciplines.

We used convenience sampling where the survey was distributed via the Australian Government Department of Health Chief Allied Health Officers – an established national network and communication hierarchy that provides access to allied health directors in each state. The chief allied health officers were asked to distribute an explanatory email (Appendix 4) to allied health discipline directors (with the PI carbon copied). The allied health directors were asked to forward the survey (Appendix 5) and participant information form (Appendix 2) to each of the most senior ICU allied health clinician for each discipline at their hospital.

To help determine the sample frame, we asked the allied health directors to reply to the initial email with a simple check-box response (Appendix 6).

Survey administration

The survey was open and available for a three-month time period (13 July 2021 to 13 October 2021). This duration of data collection allowed time for the survey to circulate and the participants to respond. A reminder email was sent to the national chief allied health Officers, at the halfway mark (Appendix 7), requesting them to send a prompt email with the survey link, to assist with response rate.

For the purpose of this study, allied health professionals were those not considered part of the medical, dental or nursing professions, and who typically present Australian ICUs, based on prior literature (10-12). To our knowledge, this included physiotherapy, speech pathology, dietetics, social work, pharmacy and occupational therapy.

Allied Health members from sciences who receive the invitation and wished to participate in this identified as “other”.

Non-ICU allied health clinicians and those who were not involved in pandemic planning were excluded from the study.

Preventing multiple entries from the same individual

Following hand-checking of the data, no set of responses appeared the same. It is understood that no participant completed the survey twice. No techniques to analyse the log file for identification of multiple entries were used.

Data analysis

Descriptive statistics were used to report demographic and survey data with continuous variables reported as medians (IQRs), and categorical variables reported as proportions (%), using IBM SPSS Statistics for Windows, version 22 (IBM Corp: Armonk, NY). Normally distributed data are presented as mean (SD). Content analysis was used to group responses together according to key themes. Sections of qualitative data were cross-referenced independently between the authors to ensure the interpretative rigor of analyses.

Results

A total of 40 responses were received via three allied health directors, from three states/territories (Australian Capital Territory, Northern Territory and South Australia) responding directly to the initial email request. However, the exact number of staff who received the survey across Australia, and the

associated participation rate is unknown. Overall, the results are reported collectively across allied health as a workforce, rather than single discipline responses.

Participant demographics

Of the respondents, the survey reached ten different allied health professionals including physiotherapy, occupational therapy, speech pathology, dietetics, social work, pharmacy, prosthetics and orthotics, exercise physiologist, spiritual care, and aboriginal liaison services.

Staff from metropolitan 17 (42.5%) or tertiary/ metropolitan 12 (30%) hospitals most frequently responded to the survey, with, physiotherapists 12 (30%) and occupational therapists eight (20%) the most frequent of the disciplines to respond. There were five (12.5%) respondents from rural or regional Australia. The majority of respondents were from New South Wales (NSW) 24 (60%), and a smaller proportion of respondents were from other states – Australian Capital territory (ACT) six (15%), South Australia (SA) five (12.5%), Northern Territory (NT) three (7.5%), Western Australia (WA) two (5%) (Table 1).

Baseline allied health staffing levels in Australian adult ICUs prior to the COVID-19

Prior to the COVID-19 pandemic, 75.6% of allied health had a mean (SD) of 1.74 (1.78) full-time equivalent (FTE) staff designated to the ICU with a mean of 21.53 (11.4) ventilator bed capacity. A total of 22% of respondents serviced their ICU on a referral-only basis (Table 2).

Allied health pandemic planning and surge response to COVID-19 in Australian ICUs -Surge planning and decision making

In preparation for COVID-19, overall, respondents reported they planned to provide a mean (SD) of 2.2 (2.6) FTE (was planned to service an average of 30 planned ICU surge beds (ranging from three to 76 planned beds). The largest response to this question was from physiotherapists 12 (30%) who reported their mean baseline FTE at 2.83 (2.18); with a planned increase of staff FTE up to 6.8 (5.58) for a mean 46 (39.96) ICU bed increase throughout the pandemic. Inconsistent data are gathered from the other disciplines 28, with some respondents unsure of this data (Table 3).

Decision-making regarding discipline surge planning was predominantly based on discussion with the ICU, allied health division, and/or respective discipline departments. Available funding to increase services to the ICU was the main limiting factor reported. Across the respondents, an average of 7.5 additional FTE was made available for redeployment (Table 2).

Staffing considerations

The majority (58%) of planned staff members to work in the ICU during surge were from their internal hospital staff pool. However, it was acknowledged by respondents that further ICU upskilling would be required for this workforce. The majority of respondents (78%) did not consider external workforces to help supplement ICU staff. However, a smaller proportion of respondents (20%) considered other external staffing options such as ex-employees or locum staff pools. Two percent of respondents did not provide a response.

With regard to training, face-to-face and/or simulated training, or on the job training were the most common modes of upskilling staff, supplemented by self-directed learning.

Surge planning implementation

During the peak of the pandemic in the study reporting period, an average of 3.68 FTE was utilised, with 42% of respondents not requiring additional staffing FTE to meet service demand.

During COVID-19, there were many changes to the usual model of care were reported, including ward/ICU based care, restriction into ICU, and remote review. Multiple new skills and tasks were introduced to the expanded model of care, notably delivery of education/training and PPE support. However, a small number of disciplines did not report changing their model of care.

All respondents reported no major adaptations were made to the initial pandemic plan throughout 2020, although minor changes such as additional training or patient material development were described.

With regards to equipment to fulfill their clinical duties, 65% of participants felt this was adequate, whilst 35% did not. Lack of equipment was described as inadequate access to technological equipment such as computers, headsets, and iPads.

Infection control and staff well being

Implementation of various measures to reduce COVID-19 transmission amongst team members were reported these included self-declaration and screening of infection status, use of PPE, and split teams in different office spaces. The majority of participants (78%) reported feeling somewhat to very safe working in ICU during COVID-19, as measured on a four-point scale.

Despite implemented strategies, few (12.5%) staff were furloughed and mostly impacting fewer than five staff, and only one outbreak that impacted more than ten staff.

There were both formal and informal strategies to support wellbeing, including formal staff or peer support programs and informal team zoom meetings.

Discussion

Key findings

In this national survey of allied health clinicians, we found that surge planning was mostly based upon discussion within the ICU, allied health department and/or respective disciplines with available funding acting as the main limiting factor for availability of resources and implementation. Whilst we noted a coordinated approach for surge planning amongst medical and nursing workforces (3), the approach to allied health staffing and associated decision-making appeared to be ad hoc at a local level. Internal redeployed allied health staff were critical to supplement this workforce. The impacts of redeployment on these staff is an area that warrants further exploration given emerging data that psychosocial outcomes can be worse for these staff, and well-being and training strategies may need to be employed to ensure ongoing flexibility of this workforce for any future surges (13, 14). Internal staff members undertook ICU up-skilling via on the job, simulation-based training, and self-directed learning in order for disciplines to meet the proposed surge demand, noting limitations in having a readily available ICU workforce. The majority of staff felt ‘somewhat’ to ‘very safe’ working in ICU during the COVID-19 pandemic.

Comparison with Previous Studies

It was estimated that Australian ICUs could nearly triple intensive care bed capacity in response to predicted increased demand associated with COVID-19 in March 2020. It was highlighted that maximal surge could result in ICU equipment shortage and would require a large increase in workforce, with these estimates derived from existing registries (3). However, similar data and estimates of allied health surge capacity was unavailable for pandemic workforce planning as the Australian and New Zealand Intensive Care Society (ANZICS) Critical Care Resources (CCR) registry holds limited data regarding baseline allied health staffing in ICU (13).

Pre-existing data in the study by Litton and colleagues was supplemented by a survey of ICU surge capacity distributed to each ICU in Australia via the ANZICS registries mailing list, ICU directors, or when unavailable the nurse unit manager (3). No allied health surge capacity could be estimated in the absence of these questions from the supplementary survey. Similarly, to our survey, this study was developed with feedback by other ICU clinicians and contained questions on the incremental capacity to increase ICU beds, equipment, and workforce.

To the best of our knowledge this is the one of the first studies to attempt to capture baseline data and pandemic surge plans for allied health in Australian ICUs. This is important to help inform future surge planning and health policy – to ensure that patients admitted to ICUs have access to allied health therapies to support their acute care needs and recovery post-ICU.

Our survey also explored staffing considerations, surge planning and implementation, infection control and wellbeing, aligning with ANZICS Recommendations for workforce and staffing in the COVID-19 pandemic (15).

Study Strengths and Limitations

The study design was rigorous based upon the Checklist for reporting results of internet e-survey results (CHERRIES) and with input from National allied health disciplines, including physiotherapy, speech pathology, and dietetics, nursing and medical. Due to limited resources available to disseminate the survey, communication via the National Chief Allied Health Officers was the chosen means of dissemination and recruitment. Despite this targeted approach the survey response rate was low. The timing of survey administration was during the Delta COVID-19 wave when health services in some states were under extreme pressure. This resulted in a lack of feedback regarding the success of the

survey administration and distribution from allied health directors, and therefore we are unable to report on this.

Although the study was designed to be low burden for participants, the timing of survey distribution aligned with the COVID-19 Delta surge, particularly in NSW and Victoria in 2021, likely limiting survey uptake. While our response rate was low, this demonstrates the ongoing need for a coordinated approach to understanding allied health staffing in Australian ICUs and establishment of research infrastructure to better routinely capture data. Our study demonstrated the challenges associated with capturing and ICU allied health professionals in Australia, which may have been magnified during the pandemic. One of the challenges in reaching ICU allied health professionals is that allied health are often employed separate to the ICU with no recommended standardised FTEs or therapist to patient ratios, therefore can be a hard-to-reach group. Allied health staffing related to ICU is likely to be variable across Australia and subsequently is hard to quantify. An alternative recruitment strategy, to better capture national data, may have been promotion of the survey via professional societies such as ANZICS, social networks, and critical care special interest groups. Future work should be undertaken to integrate a coordinated approach to communicate with, and capture ICU allied health data. For example, the ANZICS Point Prevalence Program via ANZICS CORE could be an ideal existing infrastructure to help begin this coordinated effort to reach allied health.

Implications for Clinicians, Educators and Administrators

This study explores the impact of COVID-19 in the early “alpha” phase, which had less impact on Australian healthcare systems than initially anticipated – likely as a result of successfully implemented public health measures to reduce disease burden. Following survey dissemination, Australia was faced with subsequent Delta and Omicron COVID-19 waves where surge plans were likely adapted and/ or implemented. Research conducted during or following the Delta and Omicron COVID-19 waves may produce significantly different survey responses. The above suggestions are important to consider in order to better understand the impact on ICU allied health workforce at this time.

With the majority of staff relying on internal staff redeployment and ICU up-skilling in the lead up to the surge response, allied health hospital teams should consider coordinated ICU training models in the future, especially in disciplines that pre-dominantly rely on face-to-face interaction. Increased availability and access to technological devices (laptops, iPads, and headsets) should also be considered (10, 14)

especially for disciplines that can work remotely from ICU. Staff responses were based upon the responses from senior staff members, and therefore may not highlight the perceptions of the allied health ICU team at all staffing levels.

The research highlights that there was limited ability for allied health staff to plan at a national level for a pandemic of this magnitude. Subsequently this was done at local health service levels. At the time of survey administration, pressure within the health system impacted the response rate. A key recommendation from this work is that there needs to be greater infrastructure established to facilitate operational planning. Further, such infrastructure would ensure a coordinated mechanism to conduct research to gather these important data in both 'usual' and pandemic conditions - similarly to that which is available for medical and nursing workforces.

A major implication of these findings is that the baseline rate of allied health staffing in ICUs remains unknown and the variability across allied health and within the specific disciplines is undetermined. Further research infrastructure to capture ICU allied health workforce data is urgently needed to guide future pandemic preparedness and decision making.

Conclusions

In this study, we found that allied health staff in Australian ICUs had planned to increase their baseline staffing in response to prepare for surge conditions, however implementation of these plans was limited in early 2020. Interprofessional decision-making for surge planning was based upon discussion with the ICU team and guided by national guideline development. These findings are limited by the methodological design of survey-based research and a low response rate. Further studies are required to better understand how the allied health ICU team operates under usual conditions, and the COVID-19 surge response that occurred later in 2020-2021.

Table 1 – Demographics

Variable	**n 40 (%)**
Discipline	
Physiotherapy	12 (30)
Occupational Therapy	8 (20)
Dietetics	7 (17.5)
Speech Pathology	5 (12.5)
Social Work	4 (10)
Pharmacy	3 (7.5)
Other (spiritual care)	1 (2.5)
State	
NSW	24 (60)
ACT	6 (15)
SA	5 (12.5)
NT	3 (7.5)
WA	2 (5)
Region	
Metropolitan	17 (42.5)
Metropolitan/Tertiary	12 (30)
Tertiary	6(15)
Rural/ Regional	3 (7.5)
Rural/Regional/Tertiary	2 (5)

Table 2. Descriptive Statistics – Non discipline specific

	N	Minimum	Maximum	Mean	Standard Deviation
Pre COVID-19 FTE	29	.0	9.2	1.741	1.7761
Baseline ICU Bed capacity	34	1	52	21.53	11.405
Initial COVID-19 planned bed capacity	14	3	76	30.43	19.504
Planned COVID-19 staff FTE at maximal surge	27	.0	10.2	2.215	2.6031
Staff made available for redeployment	33	.0	48.0	7.542	10.4867

Table 3. Descriptive Statistics – Discipline specific

	N	Minimum	Maximum	Mean	Standard Deviation
Pre COVID-19 FTE					
Physiotherapy	12	1.0	9.2	2.833	2.186
Occupational Therapy	7	0.0	0.4	0.057	0.151
Social Work	2	0.0	1.8	0.900	1.273
Speech Pathology	4	0.0	0.3	0.925	1.723
Dietetics	7	0.2	1.2	0.786	0.358
Pharmacy	3	0.8	2.8	1.067	1.514
Baseline ICU Ventilator Bed capacity					
Physiotherapy	12	1	40	21.0	10.80
Occupational Therapy	5	12	36	22.8	8.67
Social Work	3	10	24	15.0	7.81
Speech Pathology	5	8	31	17.8	9.15
Dietetics	7	9	50	24.4	12.84
Pharmacy	1	4	4	4.0	-
Initial COVID-19 planned bed capacity					
Physiotherapy	8	18	140	46.00	39.96
Occupational Therapy	1	40	40	40.00	-

Social Work	1	10	10	10.00	-
Speech Pathology	3	3	23	12.67	10.02
Dietetics	2	36	76	56.00	28.28
Pharmacy	0	-	-	-	-
Planned COVID-19 staff FTE at maximal surge					
Physiotherapy	9	2.0	20.0	6.800	5.578
Occupational Therapy	2	0.0	0.4	0.200	0.283
Social Work	2	1.0	1.8	1.400	0.566
Speech Pathology	3	0.0	4.0	1.567	2.136
Dietetics	4	0.5	1.5	1.000	0.408
Pharmacy	2	0.4	2.8	1.600	1.697
Staff made available for redeployment					
Physiotherapy	12	0.5	98.0	20.63	25.67
Occupational Therapy	6	0.0	3.0	1.00	1.26
Social Work	4	0.0	3.0	1.75	1.50

Speech Pathology	4	0.0	4.0	1.85	1.96
Dietetics	5	0.0	10.0	2.80	4.38
Pharmacy	3	0.0	12.0	5.67	6.03

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