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REVIEW

Sustaining the Australian respiratory workforce through the COVID-19 pandemic: a scoping literature review

Emily Stone,[1,2] Louis B. Irving,[3] Katrina O. Tonga[1,2,4] and Bruce Thompson[5]

[1]Department of Thoracic Medicine and Lung Transplantation, St Vincent's Hospital Sydney, [2]School of Clinical Medicine, UNSW Medicine and Health, St Vincent's Clinical Campus, and [4]Northern Clinical School, University of Sydney, Sydney, New South Wales, and [3]Department of Respiratory and Sleep Medicine, Royal Melbourne Hospital, and [5]School of Health Sciences, Swinburne University of Technology, Melbourne, Victoria, Australia

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Correspondence
Emily Stone, Department of Thoracic Medicine and Lung Transplantation, St Vincent's Hospital Sydney, Victoria Street, Darlinghurst, NSW 2010, Australia.
Email: emily.stone@unsw.edu.au

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Abstract

The outbreak of the COVID-19 pandemic in late 2019 and in 2020 presented challenges to healthcare workers (HCW) around the world that were unexpected and dramatic. The relentless progress of infection, starting in China and rapidly spreading to Europe, North America and elsewhere gave more remote countries, like Australia, time to prepare but also time for unease. HCW everywhere had to readjust and change their work practices to cope. Further waves of infection and transmission with newer variants pose challenges to HCW and health systems, even after mass vaccination. Respiratory medicine HCW found themselves at the frontline, developing critical care services to support intensive care units and grappling with unanticipated concerns about safety, risk and the need to retrain. Several studies have addressed the need for rapid changes in the healthcare workforce for COVID-19 and the impact of this preparation on HCW themselves. In this paper, we present a scoping review of the literature on preparing HCW for the pandemic, explore the Australian experience of building the respiratory workforce and propose evidence-based recommendations to sustain this workforce in an unprecedented high-risk environment.

Introduction

The viral pandemic of COVID-19 emerged in Wuhan, China, in late 2019 and rapidly spread around the world. Reports of intense critical care activity and hard community lockdowns in China foreshadowed the detection of cases in other countries and stimulated rapid pandemic planning for many governments and healthcare communities. Italy and then promptly Spain had little time for preparation before their critical care systems were overwhelmed. However, there was time for Italian physicians to warn of the speed and magnitude of the outbreaks and to emphasise the need for preparation, initially by video recording,[1] a modality that reflected the pace of the pandemic and that heightened the urgency of response. The chaos of outbreak response in countries with relatively sophisticated medical systems, such as the United States and the United Kingdom, presented a sobering front. As the caseload swelled rapidly in many countries, the preparatory efforts intensified in others who were, perhaps, 'behind the curve'. Australia, like New Zealand, benefitted from remote geography and time for planning, but even with this respite, healthcare practitioners faced high levels of initial fear and anxiety,[2] combined with a sense of commitment and responsibility that was, for most, alarming and new. The hardware requirements of pandemic response – personal protective equipment (PPE), ventilators, drugs, reorganisation of healthcare services – were clear to see. What might have been less apparent was the need for mental preparation. The 2021 outbreaks of newer variants in much of Australia, as well as in other countries, have required healthcare services to adjust again, reintroducing restrictions, alert levels, expansion of isolation wards and additional intensive care unit (ICU) capacity. The pressure on healthcare workers (HCW) has been made evident in Australia through reports (largely in the media) highlighting staff shortages due to furlough, resignations and career change.

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Aims

In this paper, we have the following aims: to review the literature on HCW preparation for the COVID-19

pandemic; to highlight potential key professional groups and resources for respiratory medicine pandemic preparation; and to explore the evidence base for future pandemic response recommendations.

Scoping literature review on HCW workforce planning

A scoping literature review was performed. English language publications in the National Library of Medicine through the PubMed search engine were considered using four search strategies. Papers were included if there was a primary focus on respiratory workforce concerns, HCW preparation, HCW well-being, health services preparation and evaluation of HCW preparedness and ability to cope with the pressures of the pandemic. Papers were excluded if they focussed primarily on parallel issues, such as virological screening of HCW, details of testing or simulation programmes, PPE supply chains and PPE management, impact of the pandemic on other subspecialty areas (such as paediatrics or rheumatology, aged care, anaesthetics, psychiatry, telehealth, rehabilitation, sleep medicine and cardiology), non-healthcare settings, epidemiology, gender issues, data systems, autopsy practices and novel technologies. A small number of papers appeared in more than one search or were derived from *ad hoc* search findings.

Search strategies were as follows: A. 'COVID-19 pulmonology workforce'; B. 'COVID-19 pandemic workforce respiratory'; C. 'COVID-19 pandemic workforce respiratory preparation'; and D. 'COVID-19 healthcare workers preparation frontline'.

Results of scoping literature review

The above search strategies identified the following number of papers in total and papers included, and the remaining papers were excluded as not relevant to the study aim: Search A, 6/35 papers (17%); Search B, 21/109 papers (19%); Search C, 1/14 papers (7%); Search D, 23/47 papers (49%). Subsequent *ad hoc* search strategies added two further papers.[3,4]

The papers included for review were published largely between 21 March 2020 and 15 September 2021. They are summarised in Table 1 and include the following categories: surveys, discussion of health services preparation, commentaries, qualitative research, modelling of preparation strategies and literature reviews.

Surveys

Surveys covered HCW from China,[6,8,18] Pakistan,[9] India,[20] the United Kingdom,[12,17,35,43] Libya,[23,35,46] Spain,[32] Singapore,[42] South Africa,[44] the United States,[31,47] Australia[3,48,54] and Turkey.[39] Surveys identified a number of concerns among HCW, including lack of PPE,[17,20,23,32,33,43,44] lack of preparedness,[9,17,20,23,44,46,48,55] staff shortages[32,33,43] and infection risk.[6,8,18,31,42,54] Additional factors contributing to mental health disturbances included lack of supervisor or institutional support,[31,49,55] female sex,[6,39] relative youth,[31,35,39] isolation from family,[8,39] family and home stressors[31] and relative inexperience.[35]

Discussion of health services preparation

The preparation of health services for the pandemic was discussed in papers from the United States,[19,21,40,45] Singapore,[15] the United Kingdom[26] and Cameroon[38] with a strong focus on the ability to rapidly increase intensive care capacity.[15,19,21,38] The daunting lack of intensive care bed capacity on the African continent is highlighted by Metogo and colleagues.[38] Other key health services issues were identified, including the need for rapid development of testing and isolation protocols[15,19] and retraining, even of very senior staff, to augment the critical care workforce.[15,19,26,45]

Commentaries

Commentary papers identified critical workforce issues, such as early recognition of the need for HCW protection,[5,7] the speed of the outbreak during wave one in globally recognised early hotspots[5,16] and aspects of healthcare systems that might have exacerbated outbreaks (such as just-in-time supply chains that limited access to PPE)[34] and that required rapid adaption to manage the surge (including in-hospital physical distancing strategies, HCW screening for infection, rapid uptake of telehealth and prompt redeployment of staff).[13,29,30,47]

Qualitative research

Qualitative studies from the United States,[10] Pakistan,[25,51] China,[27] Canada,[36] South Korea[37] and Denmark[50] involving a range of HCW identified a number of concerns, including infection risk, anticipated overwork, worries about community non-compliance as well as lack of PPE, lack of planning and of trust in institutions.

Modelling of preparation strategies

Three studies modelled preparation strategies for the pandemic, all from the United States. Strategies included survey tools to reduce occupational infection risk,[22] proposals for surge response[24] and scenarios to optimise shift structures that maintained workforce capacity and minimised HCW infection.[28]

Table 1 Studies included for evaluation of COVID-19 HCW workforce preparation (by publication date)

Reference	e-pub date	Country	Study type	Key points
The Lancet[5]	21/3/2020	International	Commentary	Need to protect HCW
Kang *et al*.[6]	30/3/2020	China	Survey	Mental health concerns from infection risk
Khan *et al*.[7]	2/4/2020	China	Commentary	Importance of training, support and PPE for HCW
Lu *et al*.[8]	4/4/2020	China	Survey	Fear and anxiety from high-risk setting
Khan *et al*.[9]	10/4/2020	Pakistan	Survey	Concern about lack of preparedness
He *et al*.[10]	17/4/2020	United States	Qualitative	Risk of infection, anticipated overwork
Friese *et al*.[11]	22/4/2020	United States	Commentary	Minimum PPE recommendations
Prescott *et al*.[12]	24/4/2020	United Kingdom	Survey	Need for training and guidance
Monica *et al*.[13]	7/5/2020	Singapore	Commentary	Preparation of nursing workforce
Fernandez *et al*.[14]	8/5/2020	Australia	Review	Nursing experience in previous pandemics
Goh *et al*.[15]	11/5/2020	Singapore	Health services	Rapid ICU capacity expansion
Bhatt *et al*.[16]	12/5/2020	United States	Commentary	Adapting to the speed of the outbreak
Iqbal and Chaudhuri[17]	21/5/2020	United Kingdom	Survey	Concern about lack of preparedness
Yin *et al*.[18]	31/5/2020	China	Survey	Mental health concerns from infection risk
Griffin *et al*.[19]	1/6/2020	United States	Health services	Rapid ICU capacity expansion
Singh and Sharma[20]	June 2020	India	Survey	Lack of PPE and training
Uppal *et al*.[21]	11/6/2020	United States	Health services	Rapid ICU capacity expansion
Marmor *et al*.[22]	14/6/2020	United States	Modelling	Survey proposal to reduce infection risk
Elhadi *et al*.[23]	18/6/2020	Libya	Survey	Lack of PPE and training
Katz *et al*.[24]	7/7/2020	United States + Int.	Modelling	Rapid surge capacity expansion
Munawar and Choudhry[25]	7/7/2020	Pakistan	Qualitative	Challenges for frontline ED HCW
Wexner *et al*.[26]	15/7/2020	United Kingdom	Health service	Retraining to meet critical care workforce need
Liu *et al*.[27]	17/7/2020	China	Qualitative	Danger at work and responsibility
Kluger *et al*.[28]	20/7/2020	United States	Modelling	Optimal shift structure
Bielicki *et al*.[29]	23/7/2020	Europe	Commentary	Need to protect HCW
Blecher *et al*.[30]	9/8/2020	Australia	Commentary	Workforce flexibility
Evanoff *et al*.[31]	25/8/2020	United States	Survey	Mental health concerns from high-risk setting
Alquezar-Arbe *et al*.[32]	1/9/2020	Spain	Survey	Lack of PPE and training
Wahlster *et al*.[33]	11/9/2020	International	Survey	Lack of PPE and critical care staff
Kavanagh *et al*.[34]	7/11/2020	United States	Commentary	Healthcare system factors that worsened the pandemic
Roberts *et al*.[35]	7/11/2020	United Kingdom	Survey	Anxiety and resilience in nursing staff
Brophy *et al*.[36]	11/11/2020	Canada	Qualitative	Lack of PPE and trust
Lee and Lee[37]	3/12/2020	South Korea	Qualitative	Lack of planning
Metogo *et al*.[38]	11/12/2020	Cameroon	Health service	Lack of ICU capacity in Africa
Ceri and Cicek[39]	15/12/2020	Turkey	Survey	Mental health risk factors for HCW
Wilson *et al*.[40]	4/1/2021	United States	Health service	Planning for HCW capacity
Rieckert *et al*.[41]	6/1/2021	Netherlands	Review	Practical recommendations for HCW
Lau *et al*.[42]	16/1/2021	Singapore	Survey	Danger at work and responsibility
Gemine *et al*.[43]	28/1/2021	United Kingdom	Survey	Work-related burnout
Moodley *et al*.[44]	1/2/2021	South Africa	Survey	Concern about lack of preparedness
Hussain and Kataria[45]	1/4/2021	United States	Health service	Rapid ICU capacity expansion
Roberts *et al*.[46]	8/4/2021	United Kingdom	Survey	Psychological stress in doctors during pandemic acceleration
Roberts *et al*.[47]	26/4/2021	United States	Commentary	Skillset matching and redeployment of physician workforce
Sotomayor *et al*.[48]	28/5/2021	Australia	Survey	Preparedness of infectious diseases physicians
Munn *et al*.[49]	7/7/2021	United States	Survey	Resilience and well-being in HCW
Roberts *et al*.[35]	22/7/2021	United Kingdom	Survey	Factors affecting mental health in respiratory nursing staff
Rosted *et al*.[50]	26/7/2021	Denmark	Qualitative	Factors that influence mental overload in COVID-19 HCW
Shahil Feroz *et al*.[51]	3/8/2021	Pakistan	Qualitative	Factors affecting HCW in providing pandemic healthcare
Dutta *et al*.[52]	7/8/2021	India	Syst. review	Mental health in HCW providing pandemic healthcare
Wang *et al*.[53]	10/8/2021	United States	Review	Multiple disciplines and teamwork to manage acute surge

Table 1 *Continued*

Reference	e-pub date	Country	Study type	Key points
Smallwood *et al.*[54]	18/8/2021	Australia	Survey	Moral distress in HCW†
Smallwood *et al.*[55]	2/9/2021	Australia	Survey	Impact of occupational disruption on HCW mental health†
Hill *et al.*[3]	9/9/2021	Australia	Survey	Factors affecting HCW willingness to work
RACP[4]	November 2021	Australia	Survey	Impact of COVID-19 on HCW work and wellbeing

†Australian COVID-19 Frontline Healthcare Workers' Study.
ED, emergency department; HCW, healthcare workers; ICU, intensive care unit; Int., international; PPE, personal protective equipment; RACP, Royal Australasian College of Physicians; Syst., systematic.

Review papers

Review papers included systematic reviews on nursing experience from past viral pandemics[14] and mental health problems in HCW during COVID-19.[52] A scoping review of working conditions in past pandemics developed practical recommendations for both planning periods (education, training) and surge periods (psychosocial support, attend to intensity of work patterns).[41] A retrospective review emphasised the importance of multidisciplinary clinical teams.[53]

Discussion

The Australian COVID-19 pandemic in 2020 had two main waves of infection. The first case was detected on 25 January 2020 in a patient recently returned from China.[56] Cases rose rapidly over the next few weeks, largely in returning travellers and the Australian government shut down borders in a staggered fashion, initially for returnees from China and then Iran and other countries before fully closing the borders to international arrivals in late March 2020.[57] Borders remained closed to international arrivals for many months with mandatory quarantine in place for the small number of returning travellers. At the time of writing, vaccination is mandatory for international arrivals unless a valid medical exemption is held. Hospitals around the country began planning for response in February 2020 with marked acceleration before the shutdown of essential services and elective surgery at the end of March 2020. Sydney in New South Wales was the epicentre of the first wave in April 2020[58] and for many hospital-based respiratory physicians, work requirements changed rapidly, with the introduction of COVID-19 teams to staff COVID-19 wards and government modelling that indicated likely rapid surges in caseload to match international experience. Multiple meetings addressed the pressing issues, such as access to PPE, sufficient training in infection control, the mapping out of 'hot' zones, ICU surge capacity and redeployment of staff. Many hospitals provided upfront psychological support, which surprised us with its value. By the end of May, the curve had flattened and work rosters were returning to previous arrangements.

Subsequent outbreaks developed, largely related to leakage from hotel quarantine. These occurred predominantly in NSW where an area of Sydney went into lockdown over December 2020 and January 2021 and in Victoria, where several further lockdowns were instituted in mid-late 2020 and early 2021. Australia's third major wave of COVID-19 cases started in mid-2021, again from quarantine leak. This wave, involving the Delta variant of the SARS-CoV-2 virus, resulted in rapid case escalation, pressure on hospital systems, statewide lockdowns in NSW and Victoria and accelerated vaccination uptake. It also led to a change in long-term strategy in some Australian states, moving from elimination to containment. From the international perspective, Australia has still been lightly hit by the pandemic, a fact well recognised by the local healthcare community and general population. Nonetheless, the impact of preparation and implementation on HCW, concomitant fear and anxiety and the need for retraining (in PPE, infection control and critical care) poses a challenge to the system that warrants evaluation for ongoing and future responses. Additional difficulties with vaccination rollout, including perceived delays to subgroups, such as junior medical officers in the initial phase, lack of supply and complex messaging about options have also contributed to stress, anxiety and controversy. Australia's mass vaccination programme resulted in national levels of adult vaccination above 90%[59] by the end of 2021. However, a further wave of infections related to emerging viral variants and easing of restrictions developed in Australia's eastern states and at the time of writing, has led to further pressure on healthcare systems and HCW, with a distinct shift away from lockdowns and severe restrictions at government policy level.

As the pandemic has progressed, Australia has gone through different phases, including intense rapid preparation (early 2020), management of first and second waves (mid-late 2020), the delta wave (mid-late 2021)

and the omicron variant (end-2021). The demands of each phase have called on various areas of subspeciality expertise and service provision. The pandemic has required at different times and in varying intensity such elements as public health measures, expertise in intensive care and respiratory medicine, infection control and governmental social supports. COVID-19 is primarily a respiratory disease, but its high infectivity mandates infection control expertise and training. Initial belief about droplet spread as the main cause of transmission emphasised traditional infectious disease expertise; subsequent evidence for aerosol spread gave more weight to respiratory expertise.[60] Concerns about aerosol spread from routine treatment of respiratory failure (such as non-invasive ventilation and high-flow oxygen) need to be addressed by relevant experts – in respiratory medicine, intensive care and infection control. Given the high risk of severe disease in the elderly, expertise in geriatric medicine is required to address the specific needs of this group, including delirium and appropriate end of life care.[61] As may be the case for other respiratory infections, management of COVID-19 disease and the public health impact of the SARS-CoV-2 pandemic has many strands and requires multidisciplinary teams, strategies and collaboration between craft groups.

From the literature reviewed, we have explored possible directions for future respiratory pandemic responses. The papers reviewed have highlighted the benefits of interaction between multiple disciplines, including redeployment of physician staff and cross-matching of skillsets[47] and tiered staffing models to maximise critical care physician capacity.[45,53] Availability of clinical resources affected HCW as they adapted to the needs of the pandemic, including PPE,[7,11,20,23,32,33,36] ICU surge capacity[19,21,24,45] and system factors, such as workforce flexibility[30] and shift structure.[28] We anticipate benefits from involving pivotal craft groups, such as respiratory physicians in developing plans for critical clinical resources in this and future pandemics. The need for retraining was made apparent in a number of studies, particularly for critical care skills[15,26,53] and infection control.[12,15,23] Many of the studies focussed on HCW mental health and well-being, highlighting factors that contributed to anxiety and stress, including the need to work in a high-risk setting,[4,6,8,10,18,25,27,29,31] burnout,[43] concerns about preparedness and planning[9,17,32,33,37,40,44,48] and the need for psychosocial support.[41]

Conclusions and recommendations

The COVID-19 pandemic presented HCW around the world with new challenges. The rapid re-organisation of the Australian workforce was stressful, worsened by the fear and anxiety generated by initial reports from overseas. The literature on HCW preparedness identifies risk factors for mental health problems, such as anxiety and depression; these include most prominently the risk of infection as well as lack of support and inexperience. In the second year of the pandemic, most HCW have had access to vaccination and have had more time to organise and to prepare mentally. Concerns persist about access to resources, such as PPE and critical care capacity as well as staff shortages and the need for retraining. Many studies identified a combination of fear and commitment within HCW who stayed in their roles despite their worries. The supply of clinical resources, such as PPE, ventilators, drugs, vaccines, are likely best handled at government level, but clear communication with HCW craft groups and professional societies may help improve trust in the periods of intense preparation. Many studies have found that lack of trust with worries about personal and family safety and inadequate training contributed significantly to poor mental health in HCW through the first year of the pandemic. In Australia, as elsewhere, the challenges of mass vaccination have figured highly. HCW may also benefit from greater representation in pandemic response planning, particularly between institutions and in liaison with the government.

Based on this evidence and on experience from the COVID-19 pandemic to date, we make several recommendations for Australia's respiratory workforce to address future pandemic demands:

1 Greater respiratory medicine and multidisciplinary representation in groups that manage demand and supply of clinical resources.
2 Closer liaison between respiratory physicians and healthcare/government leadership in developing pandemic response planning both prior to and during outbreaks.
3 Upfront retraining for respiratory physicians who are prepared to participate in any pandemic response, with an emphasis on infection control and critical care skills.
4 Awareness of mental health requirements for all HCW for future pandemic responses.

These recommendations primarily address HCW concerns about safety in a high-risk work environment as the dominant factor contributing to stress and may apply equally to other groups in other phases of the pandemic around the world. Future pandemic responses will also need to address the impact on usual healthcare activity, diversion of resources, deployment of staff to pandemic

responses and HCW shortage due to isolation and furlough. Respiratory physicians, while developing interdisciplinary skills and collaborative links, will continue a likely central role in this and future respiratory pandemics.

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