

Rapid evidence checks are based on a simplified review method and may not be entirely exhaustive, but aim to provide a balanced assessment of what is already known about a specific problem or issue. This brief has not been peer-reviewed and should not be a substitute for individual clinical judgement, nor is it an endorsed position of NSW Health.

Dedicated or temporary COVID-19 healthcare facilities

Rapid review questions

1. What is the evidence regarding the use of dedicated hospitals and wards exclusively for the use of COVID-19 patients?
2. What temporary hospital facilities, including new and re-purposed buildings, have been set up during COVID-19?

In brief

Dedicated wards

- The World Health Organisation advises there will be need for multiple COVID-19 treatment areas during the community transmission phase of the outbreak
- Many jurisdictions have described ways in which they have transformed existing hospitals/wards into dedicated COVID-19 wards
- Published guidance describes elements of design such as space, infection control, waste disposal, safety of healthcare workers, which can be adapted to the context of either a new construction or makeshift construction on top of an existing structure

Temporary hospitals

- Existing buildings that have been converted into temporary hospitals include hotels, sports stadiums, convention centres, closed hospitals, fields and grounds such as parking lots
- Two new buildings were built in Wuhan, China to be used as hospitals
- There is significant variation in the capacity of the temporary facilities
- Most temporary hospitals are dedicated to COVID-19 patients, for quarantine and isolation, screening/triage, staff support and backfill capacity
- Mostly existing staff and military are utilised for the temporary hospitals, with some sites reporting the use of volunteers

Limitations

- This review is on a topic that is quickly evolving and changing, and so not all temporary hospitals that have been built may be included
- The quality of evidence included in the review is variable, with peer-reviewed publications and media reports included
- Many accounts are featured in media articles, and details are lacking

Background

COVID-19 has seen healthcare needs exceed system capacity in many countries. This review aims to identify range of temporary facilities have been created to provide additional beds.

Methods (Appendix 1)

PubMed, google and twitter were searched on 7 April 2020, with updated PubMed searches on the 12 April. If there were peer reviewed papers describing a temporary hospital/s, media articles on the same hospital/s were not included.

Results (Tables 1 and 2)

WHO guidance on operational considerations for case management of COVID-19 advises:

- Strategic priorities may include managing all patients with mild or moderate disease in community facilities (e.g. stadium, gymnasium, hotel, or tent) with access to rapid health advice.
- During community transmission, there will be need for multiple COVID-19 treatment areas; a hub and spoke model of referral is recommended. (1)

Guidance from India addresses requirements for space, infection control, waste disposal, safety of healthcare workers, partners to be involved in design and planning - which can be adapted to the context of either a new construction or makeshift construction on top of an existing structure. (2)

Experience from China highlighted essential functions of temporary hospitals (Figure 1) and the use of field hospitals. (3-7)

Temporary hospitals have been part of the response in previous pandemics such as SARS and Spanish influenza. (8-10)

Figure 1: Key characteristics and essential functions of Fangcang shelter hospitals

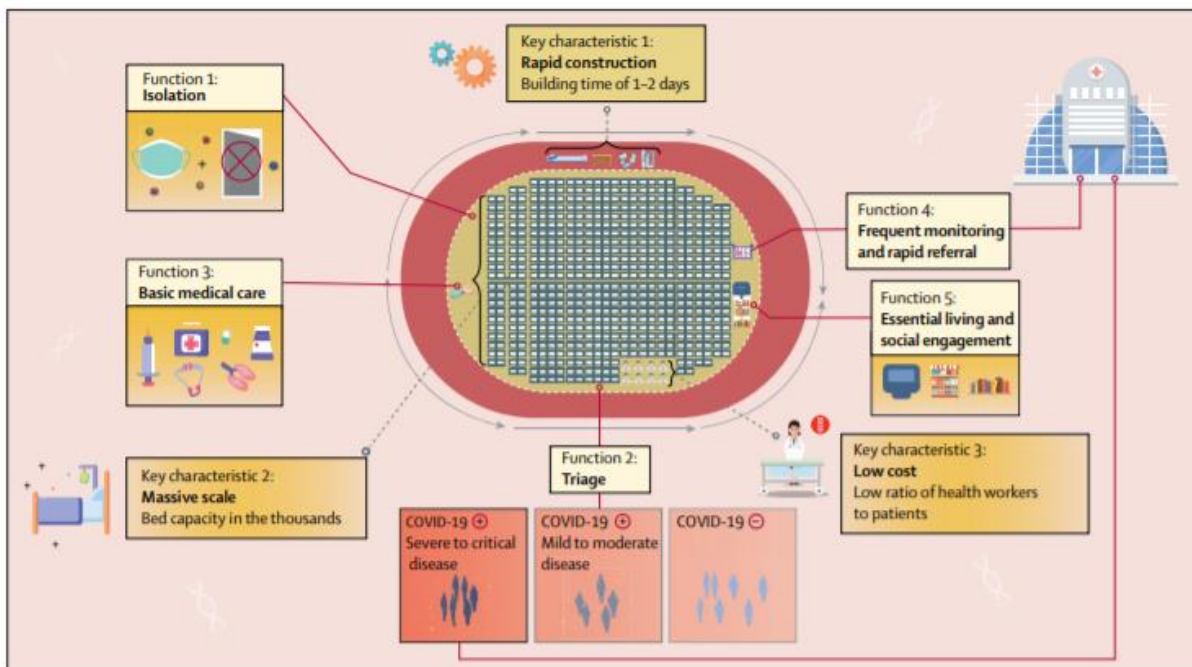


Table 1: Dedicated hospitals and wards (existing hospitals)

Source	Country	Hospital/ward	Number of beds	Building	Description
Peer reviewed publications					
Asperges 2020 (11)	Italy	Infectious disease ward	94	Classification of existing hospital	Features of dedicated wards include a dedicated taskforce for the establishment of the work, design of procedures such as for triage, training of staff and operation of the taskforce 24 h a day, seven days a week.
Remuzzi 2020 (12)	Italy	ICU unit	1028 (of 5200 total beds)	Classification of existing hospital	A focus on communication and infection control.
Rojek 2020 (13)	Australia	Nearby hospital transit lounge	unclear	Classification of other existing hospital	Prioritise prevention of nosocomial transmission (using a scalable, separated fever clinic) early planning for worsening surge (adopting scalable solutions) and clear clinical governance (providing malleable and accessible centralized resources)
Mojoli 2020 (14)	Italy	ICU unit	41	Classification of existing hospital	Organization of the intensive coronavirus unit includes: isolated areas where full personal protection equipment is mandatory; contaminated filter areas; clean areas. A similar smaller area is a buffer zone for suspected patients.
Zangrillo 2020 (15)	Italy	ICU unit ward	54 279	Classification of existing hospital	Converting pre-existing areas and creating new high technology spaces. All the involved health care personnel were rapidly trained to use personal protection equipment and to manage this particular category of patients both in general wards and ICUs.
Carenzo 2020 (16)	Italy	ICU Ward	39 unclear	Classification of existing hospital	Hospital multidisciplinary and departmental collaboration was needed to work on all principles of surge capacity, including: space definition; supplies provision; staff recruitment; and ad-hoc training. Dedicated

					protocols were applied where full isolation of spaces, staff and patients was implemented.
Media articles					
SMH article	Australia	ICU unit	19 beds	Disused level 3 Camperdown hospital	Teams of builders, bio-engineers, public health and infection control experts, nursing staff, emergency physician anaesthetic and respiratory teams, security staff and porters established the specialist coronavirus unit in record time.
Live Mint article	India	Dedicated hospital	100 beds	Unclear	Includes a negative pressure room that helps in preventing cross-contamination and helps control infection. All beds are equipped with the required infrastructure, biomedical equipment such as ventilators, pacemakers, dialysis machines, and patient monitoring devices
Philippine news agency	Philippines	Dedicated hospital	450 beds	Classification of existing hospital	Western Visayas Medical Center has been identified as dedicated facility for positive Covid-19 patients, severe patients under investigation, and those with severe acute respiratory infection
Global news	Canada	Dedicated hospital Field hospital	Unclear	Classification of existing hospital	To expand its acute care capacity

Table 2 – Temporary hospitals for COVID-19

Country	Type of site	Size	Purpose	Staffing support	Staffing roles	Description	Source
Peer reviewed publications							
China, Wuhan	New buildings	16 hospitals, 13,000 beds	Dedicated COVID-19 hospitals	Health worker to patient ratio is lower because all the patients in the hospital share the same primary admission diagnosis, reducing the complexity of care, and that all patients had mild to moderate disease	Health workers from outside the province	Fangcang shelter hospitals were implemented for the first time in China in February, 2020 for the COVID-19 outbreak. The Fangcang shelter hospitals in China were large-scale, temporary hospitals, rapidly built by converting existing public venues, such as stadiums and exhibition centres, into health-care facilities. Their three key characteristics (rapid construction, massive scale, and low cost) and five essential functions (isolation, triage, basic medical care, frequent monitoring and rapid referral, and essential living and social engagement) (Appendix3).	Chen et al. 2020 (3)
						Healthcare workers were protected from infection by disinfection of clean areas, semi-contaminated and contaminated area, healthcare personnel and patient related decontamination and occupational exposure	Yang et al. 2020 (4)
					There were approximately 1,000 medical personnel and 1,000-1,500 beds in each mobile field hospital	Medical team from a regional hospital, two emergency medical teams from the national government, two local teams	The general rules: Specialized admission, centralized quarantine, modular management, standardized treatment, and two-way referral of patients. Rules for patient management included; admission and discharge criteria, admission to critical care and referral to a hospital specialising in critical care



Rapid evidence checks are based on a simplified review method and may not be entirely exhaustive, but aim to provide a balanced assessment of what is already known about a specific problem or issue. This brief has not been peer-reviewed and should not be a substitute for individual clinical judgement, nor is it an endorsed position of NSW Health.

Country	Type of site	Size	Purpose	Staffing support	Staffing roles	Description	Source
				Cabin hospital should have about 1,000 beds, the average area of each bed about 2*2 square meters. The ratio of doctors and nurses could be approx. 1:3, and psychotherapists must be available to relieve psychological stresses.		Learnings: Sufficient space is required, there should be zones (contaminated and semi-contaminated), spaces should be modified quickly and conveniently, should contain fully functional requirements/equipment	Shu et al. 2020 (6)
				Staffing wise, the ratio is 10 physicians and 40 nurses for every 100 patients in the Ark Hospital	Health workers from outside the province	Describes one hospital: The model focuses on improving medical care quality. Patients admitted to the Ark Hospital are mild cases upon presentation, and we have divided the hospital into three areas (A, B, C) so that three medical teams can be assigned. Areas A and C have 250 beds, and area B has 300 beds.	Zhu 2020 (7)
Media articles							
London, UK	Convention centre	2 x 2000 beds	COVID-19 dedicated hospital		NHS and Military	This will be run as an NHS facility. The 4,000 critical care beds spread across two wards. Military planners and personnel are guiding the high-speed operation required to transform the site into a fully equipped emergency care centre. NHS planners to have first 500 beds ready by 30 March 2020	https://www.thsun.co.uk/news/1254481/new-london-coronavirus-hospital-morques/
London, UK	Hotel	176	Hospital support site		NHS	Accommodation for NHS staff, care workers, lower-risk patients and vulnerable cohorts.	https://www.theguardian.com/world/2020/mar/19/

Country	Type of site	Size	Purpose	Staffing support	Staffing roles	Description	Source
							hotel-chains-in-talks-to-turn-properties-into-nhs-hospitals-coronavirus
Birmingham, UK	ExCeL exhibition centre (appendix two)	Up to 4000		It took 9 days, to equip and fit 500 beds, 160+ contractors and 200 army engineers working up to 15 hour shifts. This created a hospital for 4000 people, including 80 wards of 42 beds. It has 16,000 staff (200 per ward), 750 St John ambulance volunteers and thousands of easyjet and Virgin air cabin crew have been urged to help.	Airline staff, volunteers and hospital staff,	Airlines will prioritise staff with the required skills and training and all volunteers manning the makeshift hospitals will be monitored by nurses and senior clinicians. Multiple temporary hospitals are described in the article including n Birmingham’s NEC, an exhibition space, Manchester’s Central Complex, a convention centre, the SEC Centre in Glasgow, the Principality Stadium in Cardiff	https://www.nursingtimes.net/news/coronavirus/more-temporary-hospitals-announced-ready-for-coronavirus-peak-30-03-2020/ https://www.bbc.com/news/health-52125059
Ohio, USA	Hotels, dorms and University residence halls		Increase ICU capacity and rooms for healthcare staff			Exploring how to convert hotels, dorms and residence halls at universities to increase ICU capacity and also rooms for healthcare staff	https://fox8.com/news/coronavirus/ohio-could-use-hotels-dorms-as-hospital-units-amid-



Rapid evidence checks are based on a simplified review method and may not be entirely exhaustive, but aim to provide a balanced assessment of what is already known about a specific problem or issue. This brief has not been peer-reviewed and should not be a substitute for individual clinical judgement, nor is it an endorsed position of NSW Health.

Country	Type of site	Size	Purpose	Staffing support	Staffing roles	Description	Source
							coronavirus-crisis/
Chicago, USA	Hotels	1,000 rooms	Quarantine / isolation			1,000 hotel rooms through partnerships with five hotels. The hotel rooms are intended for people who have tested positive for COVID-19 but have mild symptoms that don't require a hospital stay.	https://www.kutv.com/news/nation-world/chicago-uses-5-hotels-for-covid-19-patients-to-ease-hospital-demand
New York, USA	Convention centre	1000 beds (in first stage)	Backfill capacity		320 Federal Emergency Management Agency	Configuration will include four 250-bed hospitals each about 40,000 square feet in size. The New York National Guard, center workers and the U.S. Army Corps of Engineers are working to prepare the makeshift hospital facility in 10 days. Considering extending this model to California and other states.	https://www.latimes.com/politics/story/2020-03-20/u-s-military-can-help-in-responding-to-the-coronavirus-outbreak-within-limits
Maryland, USA	Tents	6	Screening and triage			Six hospitals in Montgomery County are installing tents where medical workers will treat patients who have symptoms of the novel coronavirus. Tents are from the Montgomery County Fire and Rescue Service or the National Guard.	https://bethesda-magazine.com/bethesda-beat/coronavirus/hospitals-set-up-tents-to-screen-separate-patients-as-they-prepare-for-coronavirus-spread/
New York, USA	Central Park	68 beds & 10 ICU beds	Hospital support site		Mount Sinai Hospital, army , volunteers	The field hospital in Central Park in New York City will be used to treat “overflow” patients from the nearby Mount Sinai hospitals.	https://www.livescience.com/coronavirus-field-hospitals-photos.html

Country	Type of site	Size	Purpose	Staffing support	Staffing roles	Description	Source
New York, USA	National Tennis Center	350	COVID-19 dedicated hospital			The tennis facility will take patients from Elmhurst Hospital, which has been overwhelmed with gravely ill coronavirus patients. But it will not be able to treat people sick enough to be in the ICU.	https://www.politico.com/states/new-york/albany/story/2020/03/31/home-of-the-us-open-to-be-converted-to-a-field-hospital-1269806
Seattle, USA	Field hospital (in soccer ground)	140 beds				Construction crews had finished a second, identical hospital tent next to the first one, creating beds for 140 infected people under A-frame roofs that stretch from one sideline to another.	https://nymag.com/intelligencer/2020/03/a-washington-town-is-turning-a-soccer-field-into-a-hospital.html
Oregon, USA	Field hospital (fairgrounds)	250 beds				The hospital, called the Oregon Medical Station, is located on the state fairgrounds in Salem, Brown said. The state purchased it years ago in preparation for an emergency such as a pandemic.	https://www.wwEEK.com/news/2020/03/18/oregon-is-opening-a-250-bed-emergency-hospital-on-state-fairgrounds-to-treat-covid-19-patients/
Cremona, Italy	Field hospital (in parking lot)	8 ICU beds, 20 general beds	Respiratory care unit			Located in the parking lot across from the city hospital, provides eight intensive care unit beds equipped with ventilators, 20 beds for general care, a laboratory and pharmacy. Established by US disaster relief, soldiers and volunteers from Italy's civil protection unit.	https://www.samaritanspurse.org.au/field-hospital-opens-receives-patients-in-italy/



Rapid evidence checks are based on a simplified review method and may not be entirely exhaustive, but aim to provide a balanced assessment of what is already known about a specific problem or issue. This brief has not been peer-reviewed and should not be a substitute for individual clinical judgement, nor is it an endorsed position of NSW Health.

Country	Type of site	Size	Purpose	Staffing support	Staffing roles	Description	Source
Sao Paulo and Rio de Janeiro, Brazil	Field hospital (soccer grounds)	200 beds per field				Brazil's top football clubs are handing over their stadiums to allow health authorities to turn them into field hospitals and clinics	https://tribune.com.pk/story/2182311/7-brazils-football-clubs-offer-stadiums-help-coronavirus-sick/
South Australia	Closed hospitals	130 beds	Dedicated COVID-19 hospital			Former Calvary Wakefield private hospital will be set up as a dedicated COVID-19 clinic, providing 130 extra beds in the city centre. The recommissioned hospitals will operate alongside other existing dedicated coronavirus clinics at the RAH, Women's and Children's Hospital and Flinders Hospital. Expected to be in operation by April 2020.	https://www.cruisese1323.com.au/lifestyle/health-beauty/two-sa-hospitals-to-reopen-ahead-of-coronavirus-surge/
Victoria, Australia	Closed hospitals		Consulting rooms and virus clinic			Baxter House (Geelong Private Hospital) will be recommissioned and will include consulting rooms and virus clinic capacity. Another 84 beds will be brought online at the old Peter Mac Hospital in Melbourne, with further 45 beds at Bendigo Health.	https://www.bay939.com.au/news/local-news/115535-baxter-house-reopens-amid-covid-19-crisis
ACT, Australia	Pop up hospital	50 beds	Mobile dedicated COVID-19 hospital		Will be operated by a mix of Aspen Medical and Canberra Health Services staff	It is expected to add about 50 beds to the ACT's capacity, and will exclusively treat COVID-19 patients. It will be a series of modular buildings like demountable that are all joined together in a single facility.	https://www.abc.net.au/news/2020-04-02/act-government-to-build-coronavirus-hospital-by-next-month/12111868
Mulhous, France	Military field hospitals and tents	30 bed			100 military health personnel — anesthetists, nurses and	Army building a 30-bed field hospital for covid-19 cases.	https://www.fox13memphis.com/news/world/solidarity-foreign/RZUFQT



Rapid evidence checks are based on a simplified review method and may not be entirely exhaustive, but aim to provide a balanced assessment of what is already known about a specific problem or issue. This brief has not been peer-reviewed and should not be a substitute for individual clinical judgement, nor is it an endorsed position of NSW Health.

Country	Type of site	Size	Purpose	Staffing support	Staffing roles	Description	Source
					nursing assistants		ELUXFYOYWX LICL5IHJFU / and https://www.fox13memphis.com/news/world/solidarity-foreign/RZUFQT-ELUXFYOYWX-LICL5IHJFU/
Madrid, Spain	Hotel	358	COVID-19 dedicated hospital			Converted a 359 room hotel. Plans to create another 4000 beds from hotels	https://www.nzherald.co.nz/world/news/article.cfm?c_id=2&objectid=12319099
Madrid, Spain	Convention centre	1300			Volunteer doctors and nurses keep coming in	Planned to scale up to 5,500 beds, including 500 for intensive care patients.	https://www.vice.com/en_us/article/k7e5ba/spain-just-opened-a-massive-coronavirus-field-hospital-in-a-convention-center
Vienna, Austria	Convention centre	880 bed	COVID-19 dedicated hospital			15,000-square-foot hall in a convention center in Vienna into an 880-bed coronavirus hospital over the course of a weekend.	https://www.washingtonpost.com/world/europe/as-coronavirus-surges-a-frantic-europe-scrambles-for-hospital-beds-ventilators-supplies/2020/03/22/75adc79e-695d-11ea-b199-



Rapid evidence checks are based on a simplified review method and may not be entirely exhaustive, but aim to provide a balanced assessment of what is already known about a specific problem or issue. This brief has not been peer-reviewed and should not be a substitute for individual clinical judgement, nor is it an endorsed position of NSW Health.

Country	Type of site	Size	Purpose	Staffing support	Staffing roles	Description	Source
							3a9799c54512_story.html
Berlin, Germany	Tents		Screening/testing			Screening/examination tents outside hospitals in germany	https://ruptly.tv/en/videos/20200303-065
Jakarta, Indonesia	2018 Asian Games Athletes Village	4208 patients	COVID-19 dedicated hospital			“The ministry of state-owned enterprises will provide supplies for the emergency hospital to handle COVID-19, be it healthcare equipment, medicine, personal protection gear and masks,”	https://nypost.com/2020/03/23/in-donesia-turns-athletes-village-to-emergency-hospital-as-coronavirus-cases-rise/
South Korea	Corporate dormitory	15-383	Treatment facilities for patients with mild symptoms		Volunteers	Large tech companies are repurposing employee dormitories to be used as coronavirus treatment centres for patients with mild symptoms (to free up hospital capacity for the critically ill)	https://en.yna.co.kr/view/AEN20200305004000320

References

1. World Health Organisation. Operational considerations for case management of COVID-19 in health facility and community. Interim guidance. . Accessed on 27 March 2020 Available from: https://apps.who.int/iris/bitstream/handle/10665/331492/WHO-2019-nCoV-HCF_operations-20201-eng.pdf. 2020.
2. Agarwal A, Nagi N, Chatterjee P, Sarkar S, Mourya D, Sahay RR, et al. Guidance for building a dedicated health facility to contain the spread of the 2019 novel coronavirus outbreak. *Indian J Med Res*. 2020.
3. Chen S, Zhang Z, Yang J, Wang J, Zhai X, Bärnighausen T, et al. Fangcang shelter hospitals: a novel concept for responding to public health emergencies. *Lancet*. 2020.
4. Yang Y, Wang H, Chen K, Zhou J, Deng S, Wang Y. Shelter hospital mode: how to prevent novel coronavirus infection 2019 (COVID-19) hospital-acquired infection? *Infect Control Hosp Epidemiol*. 2020:1-4.
5. Chen Z, He S, Li F, Yin J, Chen X. Mobile field hospitals, an effective way of dealing with COVID-19 in China: sharing our experience. *Biosci Trends*. 2020.
6. Shu L, Ji N, Chen X, Feng G. Ark of Life and Hope : Role of Cabin Hospital in Facing COVID-19. *J Hosp Infect*. 2020.
7. Zhu W, Wang Y, Xiao K, Zhang H, Tian Y, Clifford SP, et al. Establishing and Managing a Temporary Coronavirus Disease 2019 Specialty Hospital in Wuhan, China. *Anesthesiology*. 2020.
8. Shaw K. The 2003 SARS outbreak and its impact on infection control practices. *Public Health*. 2006;120(1):8-14.
9. Kearns RD, Skarote MB, Peterson J, Stringer L, Alson RL, Cairns BA, et al. Deployable, portable, and temporary hospitals; one state's experiences through the years. *Am J Disaster Med*. 2014;9(3):195-210.
10. Hobday RA, Cason JW. The open-air treatment of pandemic influenza. *Am J Public Health*. 2009;99 Suppl 2(Suppl 2):S236-42.
11. Asperges E, Novati S, Muzzi A, Biscarini S, Sciarra M, Lupi M, et al. Rapid response to COVID-19 outbreak in Northern Italy: how to convert a classic infectious disease ward into a COVID-19 response centre. *J Hosp Infect*. 2020.
12. Remuzzi A, Remuzzi G. COVID-19 and Italy: what next? *Lancet*. 2020.
13. Amanda Rojek MD, David Camilleri, Caroline Marshall, Kirsty Buising, Nicola Walsham and Mark Putland. Early clinical response to a high consequence infectious disease outbreak at the Royal Melbourne Hospital Emergency Department – insights from COVID-19. *Medical Journal of Australia* Published online 16 March 2020. 2020.
14. Mojoli F, Mongodi S, Grugnetti G, Muzzi A, Baldanti F, Bruno R, et al. Setup of a Dedicated Coronavirus Intensive Care Unit: Logistical Aspects. *Anesthesiology*. 2020.
15. Zangrillo A, Beretta L, Silvani P, Colombo S, Scandroglio AM, Dell'Acqua A, et al. Fast reshaping of intensive care unit facilities in a large metropolitan hospital in Milan, Italy: facing the COVID-19 pandemic emergency. *Crit Care Resusc*. 2020.
16. Carenzo L, Costantini E, Greco M, Barra FL, Rendiniello V, Mainetti M, et al. Hospital surge capacity in a tertiary emergency referral centre during the COVID-19 outbreak in Italy. *Anaesthesia*. 2020.

Appendix 1

PubMed search string: (("pandemics"[MeSH Terms] OR "pandemic*" [title/abstract])) AND ("field hospital" [title/abstract] OR "temporary hospital*") which identified two descriptive articles described below.



PubMed search string: ((hospital OR ward) AND (dedicated OR specialist) AND (COVID-19 OR coronavirus))

PubMed search string: ((2019-nCoV[title/abstract] or nCoV*[title/abstract] or covid-19[title/abstract] or covid19[title/abstract] OR "covid 19"[title/abstract] OR "coronavirus"[MeSH Terms] OR "coronavirus"[title/abstract] OR sars-cov-2[title/abstract] OR "severe acute respiratory syndrome coronavirus 2"[Supplementary Concept]) AND (convert[Title/Abstract] OR dedicat*[Title/Abstract] OR temporary[title/abstract] OR shelter hospital*[Title/Abstract] OR field hospital*[Title/Abstract])) Date period 2019:2020